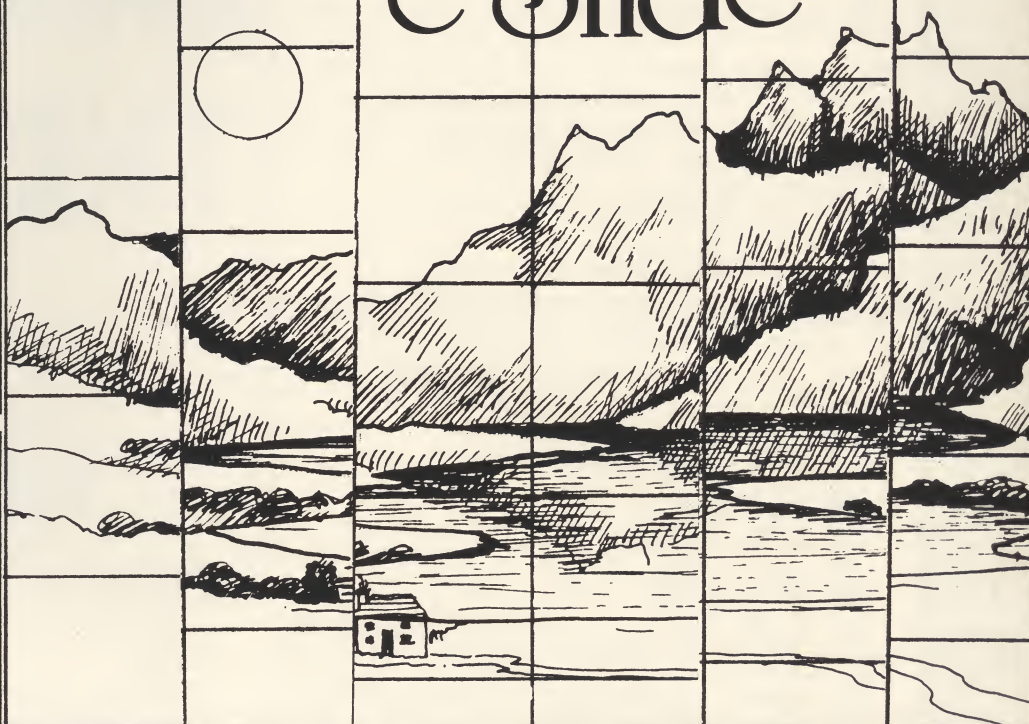


A VARIATION on those sliding block puzzles you find in Christmas stockings, **Picture Slide** uses an impressive machine-code routine to swap areas of the screen display. Written by Pete Cooke of Leicester for the 16K Spectrum, it uses a simple picture located at lines 8210-8240. If you want you can adapt the program at those lines to draw your own picture, or even use a professional draw program to create a picture.

The program uses our special graphics abbreviations so please read the section at the beginning of Program Printout for instructions on how to enter these.

# Picture Slide



```

10 CLEAR 30999
20 DEF FN A(X)=8*(X+1)
30 IF PEEK 31000<>33 THEN GO
SUB 9500
40 POKE 23658,0
100 GO SUB 8000: REM DRAW SCREE
N
105 PAPER 7
110 GO SUB 2000: REM SHUFFLE
120 LET move=1
1000 PRINT #1;AT 0,0; PAPER 7;"P
RESS ARROWS TO MOVE . MOVE ";MOV
E;AT 1,0;"(5*sp)*** Press q to q
uit ***"
1020 LET Z$=INKEY$: IF Z$<>"q" A
ND (Z$<"5" OR Z$>"8") THEN GO T
O 1020
1030 IF Z$="q" THEN GO TO 1100
1040 GO SUB 1500: LET move=move+
1: GO TO 1000
1100 INPUT "": PRINT #1;AT 0,0;
PAPER 6;"**** Stopped ****(2*sp)
Press ENTER(2*sp) to try again, R
to reshuffle.(3*sp)";
1110 IF INKEY$<>" " THEN GO TO 1
110
1120 LET Z$=INKEY$: IF Z$<>CHR$
13 AND Z$<>"r" THEN GO TO 1120
1130 IF Z$="r" THEN GO SUB 2000
: GO TO 1000
1140 RUN
1500 IF Z$="8" AND X-(Y=4)>3 THE
N BEEP .1,12: RETURN: REM X=5
Y=4
1510 IF Z$="5" AND X=0 OR (Z$=
"7" AND Y=0) OR (Z$="6" AND Y=4)
THEN BEEP .1,12: RETURN
1520 IF X=5 AND Z$<>"5" THEN BE
EP .1,12: RETURN
1530 LET a=X-(Z$="5")+(Z$="8"):
LET b=Y-(Z$="7")+(Z$="6")
1540 GO SUB 3000: RETURN
1999 STOP
2000 INPUT "How many swaps (0 TO
200) ";swaps: IF swaps<0 OR swa
ps>200 THEN GO TO 2000
2010 FOR n=1 TO 6: LET Z$="55577
7"(n): GO SUB 1500: NEXT n
2020 FOR n=1 TO swaps: LET Z$="5
678"(INT (1+RND*4)): GO SUB 1500
: NEXT n
2030 RETURN
3000 REM *** SWOP X,Y WITH A,B *
**
3010 POKE 31001,32*A+8: POKE 310
02,32*B+8: POKE 31004,32*X+8: PO
KE 31005,32*Y+8
3020 LET X=A: LET Y=B: REM EMPT
Y SQUARE
3030 LET V=USR 31000
3040 RETURN
8000 REM ** SET UP THE SCREEN **
8010 PAPER 7: INK 0: BORDER 7: C
LS : PRINT AT 0,0;"(ig4,20*g3,g7
)"

```

```

8020 FOR N=1 TO 15: PRINT AT N,0
;"(ig5)";TAB 21;"(g5)": NEXT N
8030 PRINT AT 16,0;"(ig5)";TAB 2
1;"(g1,3*g3,g7)"
8040 FOR N=17 TO 20: PRINT AT N,
0;"(ig5)";TAB 21;"(4*sp,g5)": NE
XT N
8090 PRINT "(ig1,24*ig3,ig2)"
8100 LET X=5: LET Y=4
8110 PRINT AT 0,23; PAPER 1; INK
7; BRIGHT 1;"(9*sp)";AT 1,23;"
Sliding ";AT 2,23;" Block(3*sp)"
;AT 3,23;" Puzzle(2*sp)";AT 4,23
;"(9*sp)"
8120 PRINT AT 6,23; PAPER 6;" P.
Cooke ";AT 7,23;" May 84(2*sp)"
8130 REM
8200 REM

```

\*\* PUT YOUR DESIGN HERE \*\*

```

8210 FOR n=1 TO 20: PRINT AT n,1
; PAPER (6-(n<6));"(20*sp)": NEX
T n
8220 INK 1: FOR n=20 TO 80 STEP
2:PLOT n,20: DRAW 0,n: NEXT n
8230 INK 2: FOR n=20 TO 80 STEP
2: PLOT n+76,20: DRAW 0,100-n: N
EXT n
8240 INK 8: FOR n=10 TO 30: CIRC
LE 88,90+n,n: NEXT n
8250 PAPER 4: INK 0: PRINT AT 18
,2;"(2*sp)Puzzle this out ";AT 1
9,2;"(3*sp)If you can !!(2*sp)"
8260 INK 3: FOR n=40 TO 136 STEP
96: FOR m=-15 TO 15: PLOT n,90:
DRAW m,55: NEXT m: NEXT n
8270 INK 2: FOR n=40 TO 136 STEP
96: FOR m=-15 TO 15: PLOT n,70:
DRAW m,15: NEXT m: NEXT n
8280 PRINT AT 1,3; PAPER 7; INK
1;"0000000000000000";AT 1,3; OVE
R 1;"(4*ig3)/\ /\ /\(4*ig3)"
8290 PRINT AT 2,3; PAPER 2; INK
7;"<><><><><><><><><><><><><>"
8300 RETURN
8900 STOP
9000 DATA 33,168,136,1,136,136,3
4,246,121,237
9010 DATA 67,248,121,34,250,121,
237,67,252,121
9020 DATA 62,32,50,254,121,237,7

```

```

5,250,121,205
9030 DATA 172,121,4,237,67,250,1
21,229,237,75
9040 DATA 252,121,205,172,121,4,
237,67,252,121
9050 DATA 209,6,4,26,119,62,0,18
,35,19
9060 DATA 16,247,58,254,121,214,
1,50,254,121
9070 DATA 32,209,237,75,246,121,
237,67,250,121
9080 DATA 237,75,248,121,237,67,
252,121,62,4
9090 DATA 50,254,121,237,75,250,
121,205,220,121
9100 DATA 120,198,8,71,237,67,25
0,121,229,237
9110 DATA 75,252,121,205,220,121
,120,198,8,71
9120 DATA 237,67,252,121,209,6,4
,26,119,58
9130 DATA 141,92,18,19,35,16,246
,58,254,121
9140 DATA 214,1,50,254,121,32,20
2,201,62,191
9150 DATA 144,216,120,245,230,56
,38,16,111,41
9160 DATA 41,241,245,230,192,203
,63,203,63,203
9170 DATA 63,132,103,241,230,7,1
32,103,121,230
9180 DATA 7,87,121,203,63,203,63
,203,63,133
9190 DATA 111,124,206,0,103,201,
120,230,248,111
9200 DATA 38,22,41,41,121,230,7,
87,121,203
9210 DATA 63,203,63,203,63,133,1
11,62,0,132
9220 DATA 103,201
9500 CLS : PRINT AT 5,3;"Poking
in machine code.";AT 7,9;"Please
wait."
9510 LET total=0: RESTORE 9000:
FOR n=31000 TO 31221: READ a: LE
T total=total+a: POKE n,a
9520 NEXT n
9530 IF total<>29212 THEN PRINT
""Data error ... do not RUN":
STOP
9540 RETURN

```



**T**HE PANZER divisions are rolling in a last-ditch attempt to halt the Allied advance. Your job is to guard a bridge and try to take out as many tanks as possible with your limited supply of ammunition. Use keys Z and X to move the gun and P to fire. The game increases in difficulty as you progress, and penalty points are deducted for every tank that gets through. The game was written by William Johnson of Faversham in Kent for the 48K Spectrum.

*The program uses our abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the program.*

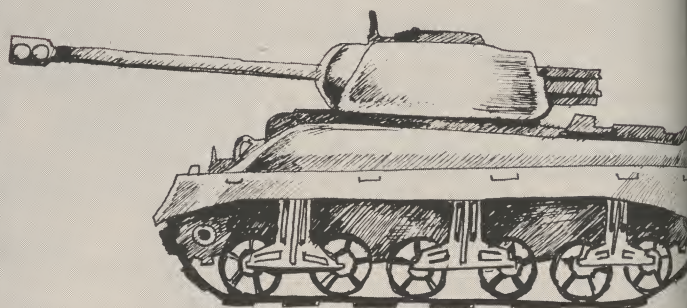
```

1 GO TO 9000
2 INK 0: PAPER 6: BORDER 6: B
RIGHT 1: CLS
10 LET x=29
15 LET cx=0
20 LET a=1
30 LET y=160
35 LET o=10
40 LET g=15
41 POKE 23296,23279-256*INT (2
3277/256)
42 POKE 23297,INT (23275/256)
43 REM PRINT PEEK 23297: STOP

50 LET score=0
55 LET speed=1
60 LET amo=20
65 LET difficulty=1.8
70 LET s=1
75 POKE 23658,0
80 GO SUB 7000
85 GO SUB 8000: GO SUB 8020
90 REM **END OF VARIABLES**
100 GO TO 1000
500 REM ***TANK MOVE*****
505 IF x<1 THEN PRINT AT 5,0;"
(3*sp)": LET score=score-100: GO
SUB 8020: GO SUB 6100: LET x=29
: RETURN
670 IF s=1 THEN GO TO 2100
675 IF s=0 THEN GO TO 2120
680 RETURN
900 REM **END OF TANK MOVE***
1000 REM **MAIN LOOP*****
1010 IF INT (RND*o)=1 THEN LET
speed=0
1100 IF speed=1 THEN GO SUB 500
1110 IF INT (RND*5)=1 THEN LET
speed=1
1121 GO SUB 5000
1125 PLOT INVERSE 1:g*8,y+diffi
culty
1130 IF y<160 THEN GO SUB 3090
1131 IF INKEY$="p" THEN GO TO 3
000
1145 IF INKEY$="z" THEN GO SUB
4000

```

# BRIDGE ON THE RHINE



```

1150 IF INKEY$="x" THEN GO SUB
4100
1400 GO TO 1000
1500 REM **END OF MAIN LOOP*****
*
2090 REM ***TANK PRINT*****
2100 PRINT AT 5,x;"AB(sp)"
2110 LET s=0: RETURN
2120 PRINT AT 5,x-1;"CDE(sp)"
2130 LET x=x-1: LET s=1: RETURN
2160 REM ****END OF TANK PRINT:
3000 REM ***BOM DROP*****
3010 PRINT AT 15,g;"G"
3020 PRINT AT 14,g;"H"
3030 RANDOMIZE USR 33000: BORDER
6: LET amo=amo-1: GO SUB 8000
3040 IF amo<0 THEN GO TO 8500
3080 PRINT AT 15,g; PAPER 6;"(sp
)";AT 14,g; PAPER 6;"(sp)"
3110 PLOT g*8,y
3120 LET y=y-difficulty
3130 GO TO 1170
4000 IF g<=0 THEN RETURN
4001 LET g=g-1
4005 LET af=(PEEK 23296)-1
4010 POKE 23296,af
4030 RANDOMIZE USR 32000: PRINT
AT 16,g;"E"
4040 RETURN
4050 POKE 23295,63
4100 IF g>=31 THEN RETURN
4105 POKE 23296,(PEEK 23296)+1
4110 LET g=g+1
4120 RANDOMIZE USR 32000: PRINT
AT 16,g;"E"
4500 RETURN
5000 REM ***HIT?*****
5050 IF y<=128 THEN LET y=160:

```



```

GO SUB 5240
5060 IF y<=134 THEN GO TO 5100
5070 RETURN
5100 IF g=X OR g=x+1 OR g=x+2 TH
EN GO TO 5200
5110 RETURN
5210 IF g=x THEN LET score=scor
e+100
5220 IF g=x+2 THEN LET score=sc
ore+50: LET amo=amo+2
5230 IF g=x+1 THEN LET score=sc
ore+75
5231 GO SUB 8020
5232 PRINT AT 5,0;"(31*sp)"
5233 GO SUB 5240
5234 GO TO 5290
5245 PRINT AT 5,g; INK 2;"G"
5247 PRINT AT 4,g; INK 2;"H"
5250 BEEP .1,-50
5270 PRINT AT 5,g;"(sp)";AT 4,g;
"(sp)"
5280 RETURN
5290 LET x=29: LET y=160
5300 IF score>=300 THEN LET amo
=amo+1
5310 IF score>=1000 THEN LET o=
15: LET difficulty=difficulty+1
5320 RANDOMIZE USR 33023
5330 RANDOMIZE USR 33023
6000 RETURN
6100 LET cx=cx+1: PRINT AT 7,0;c
x: RETURN
7100 PRINT AT 6,0; INK 4;"(6*ig8
,19*#,7*ig8)"
7110 PRINT AT 7,0; INK 4;"(6*ig8
,ig1)/(2*sp,g5,9*sp,g5,2*sp)\(ig
2,7*ig8)"
7130 PRINT AT 8,0; INK 4;"(7*ig8
,ig1,2*sp,g5,9*sp,g5,2*sp,ig2,8*
ig8)"
7140 PRINT AT 9,0; INK 4;"(8*ig8
,ig1,sp,g5)"; INK 5;"(sp,7*_,sp)
"; INK 4;"(g5,sp,ig2,9*ig8)"
7200 PLOT 48,127: DRAW 151,0
7210 PLOT 48,120: DRAW 151,0
7220 PLOT 0,167: DRAW 255,0
7300 PRINT AT 0,0; PAPER 3;"(32*
sp)"
7400 RANDOMIZE USR 32000
7410 PRINT AT 16,g;"F"
7420 POKE 23295,63
7900 RETURN
8000 PRINT AT 0,13; PAPER 3; BRI
GHT 1;;"(3*sp)AMMUNITION:(sp)";a
mo;"(sp)"
8010 RETURN
8020 PRINT AT 0,2; PAPER 3;"SCOR
E=";score;" "
8030 RETURN
8510 POKE 33006,20: POKE 33009,1
8

```

```

8520 PRINT AT 10,11; FLASH 1; IN
K 2;"GAME OVER"
8530 PRINT AT 0,26; FLASH 1; INK
2;"EMPTY"
8540 FOR A=1 TO 3: RANDOMIZE USR
33000: NEXT a
8541 POKE 33019,13: POKE 33004,1
00: RANDOMIZE USR 33000: POKE 33
004,3: POKE 33019,12
8542 PRINT AT 10,11; PAPER 3; BR
IGHT 1;"COMMENT:"; PAPER 6;"(2*s
p)"
8543 IF score>=-2000 THEN LET A
$="VEGATABLE"
8544 IF SCORE>=-1000 THEN LET A
$="GO BACK TO SLEEP"
8545 IF SCORE>=0 THEN LET A$="L
OSER"
8546 IF SCORE>=100 THEN LET A$=
"ZOMBIE"
8547 IF SCORE>=300 THEN LET A$=
"BEGINNER"
8549 IF SCORE>=800 THEN LET A$=
"IMPRESSIVE"
8550 IF SCORE>=1000 THEN LET A$
="STREET WISE"
8555 IF SCORE>=2000 THEN LET A$
="GENERAL PRO"
8557 IF SCORE>=5000 THEN LET A$
="WHIZZ KID"
8558 PRINT AT 12,11; PAPER 3; FL
ASH 1;A$
8560 POKE 33006,2: POKE 33009,24
8570 PRINT AT 0,0;"(5*sp)PRESS A
NY KEY TO PLAY(6*sp)"
8580 IF INKEY$<>" " THEN RUN 2
8590 GO TO 8580
9000 FOR z=0 TO 38: READ a: POKE
32000+z,a: NEXT z
9030 DATA 33,0,90,6,255,62,63,11
9,35,16,252,42,0,91,62,0,119,1,3
2,0,237,66,119,237,66,119,237,66
,119,237,66,119,237,66,119,237,6
6,119,201
9050 FOR a=0 TO 63: READ z: POKE
65368+a,z: NEXT a
9060 DATA 0,255,7,1,127,255,170,
85,112,254,254,248,254,255,170,8
4,0,15,0,0,7,15,5,2,7,255,255,63
,255,255,85,170,0,192,192,0,192,
224,64,128,255,165,165,165,165,1
65,165,126,149,215,90,93,107,50,
46,60,129,36,1,138,36,38,88,42
9070 FOR A=0 TO 48: READ X: POKE
33000+A,X: NEXT A
9080 DATA 33,0,0,14,3,22,2,126,2
30,24,211,254,65,16,254,35,21,32
,244,12;32,239,201,33,0,64,126,7
,119,21,35,124,254,88,32,246,33,
0,64,126,15,119,35,124,254,88,32
,247,201
9999 GO TO 2

```



**G**ET SOME practice in the nets with **Cricket** for the 16K ZX-81. You decide how many bowls you want to receive and then press 0 to bowl and D to strike the ball. The computer will then show you how many runs you have scored. The full score is given at the end of the game or when you are bowled out. Cricket was written by Mark White of Red-ditch in Worcestershire.

```

10 LET BA=0
20 GOSUB 5000
30 LET R=0
40 CLS
50 LET BA=BA+1
60 IF BA>80 THEN GOTO 6000
70 PRINT AT 15,0;" "AT 16,0
80 " "AT 17,
90 " "AT 18,
100 PRINT "
110 PRINT "
120 PRINT AT 17,29;" "AT 18,2
130 PRINT AT 15,26;" "AT 16,2
140 " "AT 17,
150 " "AT 18,
160 PRINT AT 21,0;" RUNS FOR ";
170 D#="R
180 GOSUB 9000
190 REM **HIT BALL**
200 LET K=INT (RND*2)
210 PRINT AT 15,25;" "AT 16,26;" "
220 FOR F=25 TO 0 STEP -1
230 IF K=0 THEN PRINT AT A,F;"
240 AT A,F
250 IF K=1 THEN PRINT AT 16,F;"
260 AT 16,F;"
270 LET A=A-.3
280 IF K=1 AND F=3 THEN GOTO 43
290
300 NEXT F
310 IF K=1 THEN GOTO 4300
320 CLS
330 FOR F=0 TO 21
340 PRINT "
350
360 NEXT F
370 FOR F=8 TO 12
380 PRINT AT F,8;"
390
400 NEXT F
410 PRINT AT 21,0;" RUNS FOR ";
420 D#(1)="R
430 PRINT AT 10,10;" "AT 10,20
440 "
450 LET X=9
460 LET Y=10
470 FOR F=0 TO 10
480 PRINT AT X,Y;" "AT X,Y;"
490 NEXT F
500 LET Y=Y-RND*9
510 LET L=INT (RND*2)
520 IF L=1 THEN LET X=X+RND*10
530 IF L=2 THEN LET X=X-RND*10
540 PRINT AT X,Y;"
550 IF X>15 OR X<5 THEN LET R=R
560 +4
570 IF Y<4 THEN LET R=R+4
580 IF X<15 OR X>5 THEN LET R=R
590 +1
600 IF X=21 OR X=0 THEN LET R=R
610 +6
620 PRINT AT 21,0;"RUNS FOR ";D
630 #="R
640 FOR F=1 TO 100
650 NEXT F
660 GOTO 5
670 PRINT AT 15,0;" "AT 16,0
680 " "AT 17,
690 " "AT 18,
700
710 FOR F=0 TO 50
720 NEXT F
730 GOTO 5
740 CLS
750 PRINT AT 0,5;"ENTER BATTERS
760 TERN#";
770 INPUT D#
780 CLS
790 PRINT AT 0,5;"ENTER NUMBER
800 OF BOWLS";
810 INPUT B0
820 IF B0<1 OR B0>30 THEN GOTO
830 5040
840 RETURN
850 CLS
860 PRINT AT 5,5;"TOTAL RUNS FO

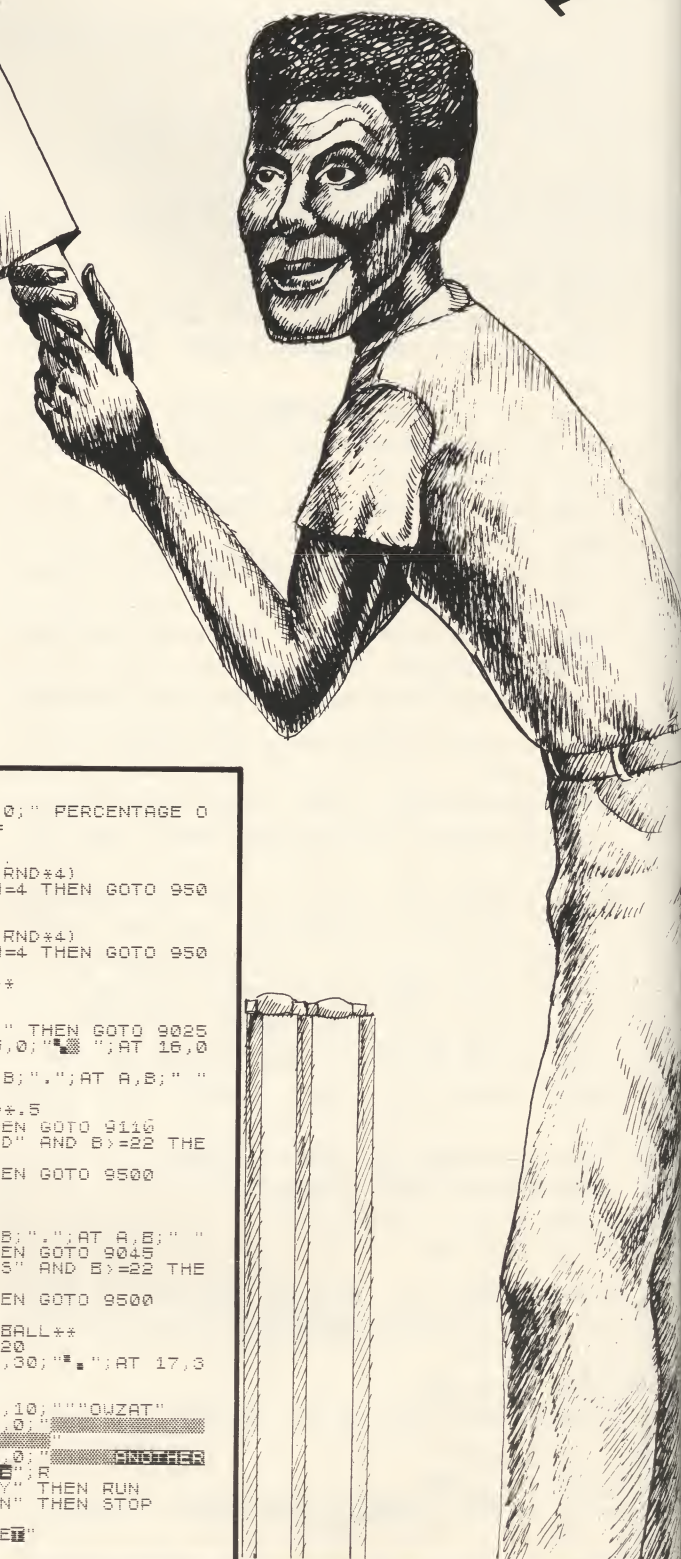
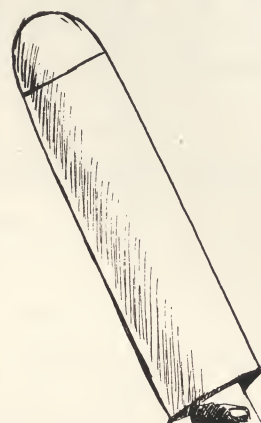
```

```

R "D#";"="R
8020 LET A=R/B
8030 PRINT AT 7,0;" PERCENTAGE O
8040 F RUNS PER BALL="
8050 "P;"#/"
8060 STOP
8070 LET H=INT (RND*4)
8080 IF H=1 OR H=4 THEN GOTO 950
8090
8100 GOTO 4000
8110 LET H=INT (RND*4)
8120 IF H=1 OR H=4 THEN GOTO 950
8130
8140 REM **BALL**
8150 LET A=15
8160 LET B=2
8170 IF INKEY#="" THEN GOTO 9025
8180 PRINT AT 15,0;" "AT 16,0
8190 "
8200 PRINT AT A,B;" "AT A,B;" "
8210 LET B=B+1
8220 LET A=A+RND*.5
8230 IF A>18 THEN GOTO 9110
8240 IF INKEY#="D" AND B>22 THE
8250 N GOTO 8000
8260 IF B>26 THEN GOTO 9500
8270 GOTO 9045
8280 LET A=A-.4
8290 LET B=B+1
8300 PRINT AT A,B;" "AT A,B;" "
8310 IF A<16 THEN GOTO 9045
8320 IF INKEY#="S" AND B>22 THE
8330 N GOTO 8500
8340 IF B>26 THEN GOTO 9500
8350 GOTO 9110
8360 REM **MISS BALL**
8370 FOR F=1 TO 20
8380 PRINT AT 17,30;" "AT 17,3
8390 "
8400 NEXT F
8410 PRINT AT 10,10;" "OWZAT"
8420 PRINT AT 21,0;"
8430
8440 PRINT AT 21,0;"
8450 "
8460 PRINT AT 21,0;"
8470 "
8480 IF INKEY#="Y" THEN RUN
8490 IF INKEY#="N" THEN STOP
8500 GOTO 9550
8510 SAVE "CRICKET"
8520 RUN

```

# CRICKET





# Wally meets the Things

**J**UST COLLECT six diamonds for us, they said. Avoid the Things and you are home and dry. So, being the Wally you are, you have a go.

**Wally Meets the Things** was written for the 16k Spectrum by P Mansfield of Cardiff. You must move Wally around the screen, but each column and row has a guardian Thing, which will move out to get you if you step onto its patch. Find the best strategy to lure the Things towards you so you can duck behind them to get the diamonds.

The game uses our special abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the program.

```

1 FOR i=0 TO 23
2 READ j
3 POKE USR "a"+i,j
4 NEXT i
5 DATA 126,219,255,195,126,66
,66,129,60,90,153,231,231,153,90
,60,24,24,8,126,8,24,36,66
6 PRINT FLASH 1; INK 4; AT 0,
5; "GET READY"
7 PRINT PAPER 1; INK 7; "USE
CURSOR KEYS TO MOVE MAN -(3*sp)W
ALLY HAS TO AVOID THE THINGYS(2*
sp)AND COLLECT(2*sp)SIX DIAMONDS
TO WIN -THE THINGYS ARE DEADLY
AND SO(2*sp)ARE THE RED AND BLUE
BORDERS(3*sp)"
8 BORDER 3
9 PAUSE 200
10 CLS
11 PLOT 0,7: DRAW 248,0: DRAW
0,167
15 PAPER 7: INK 0
20 DIM a(20)
25 DIM b(30)
35 LET w$="(sp)": LET k=0: LET
t=0
40 LET x=1
50 FOR y=1 TO 30
60 PRINT INK 2; AT x,y; "A"
70 LET b(y)=1
80 NEXT y
90 LET y=1
100 FOR x=1 TO 20
110 PRINT INK 1; AT x,y; "A"
120 LET a(x)=1
130 NEXT x
135 LET c=20: LET d=30
140 PRINT INK 3; AT c,d; "C"
150 PRINT INK 1; AT 0,0; "(31*g3
)"
155 PRINT INK 2; AT 0,0; "(ig4)"
160 FOR p=1 TO 20
170 PRINT INK 2; AT p,0; "(ig5)"
175 NEXT p
176 PRINT PAPER 6; INK 2; AT 0
,1; "B"
177 PRINT PAPER 6; INK 2; AT 0
,15; "B"
178 PRINT PAPER 6; INK 2; AT 0
,30; "B"
179 PRINT PAPER 6; INK 2; AT 6
,0; "B"
180 PRINT PAPER 6; INK 2; AT 1
3,0; "B"
181 PRINT PAPER 6; INK 2; AT 2
0,0; "B"
183 FOR u=1 TO 5
185 BEEP .05,20: BEEP .05,22: B
EEP .05,25: BEEP .05,30
187 NEXT u
190 REM move man
200 GO SUB 300
210 REM move red down
213 IF d=0 THEN GO TO 225

```



```

215 IF a(b(d))=d THEN LET w$="
A": LET k=1
220 GO SUB 400
223 LET w$="(sp)": LET k=0
225 REM move man
230 GO SUB 300
235 REM move blue across
236 IF c=0 THEN GO TO 190
237 IF b(a(c))=c THEN LET w$="
A": LET k=2
240 GO SUB 420
245 LET w$="(sp)": LET k=0
250 GO TO 190
290 REM move man
300 PRINT AT c,d; "(sp)"
310 LET d=d-(INKEY$="5" AND d>0
)+(INKEY$="8" AND d<30)
320 LET c=c-(INKEY$="7" AND c>0
)+(INKEY$="6" AND c<20)
330 IF ATTR (c,d)=57 OR ATTR (c
,d)=58 THEN GO TO 1000
335 IF ATTR (c,d)=50 THEN LET
t=t+1: BEEP .05,10
340 PRINT INK 3; AT c,d; "C"
342 IF t=6 THEN GO TO 700
343 BEEP .01,-20
350 RETURN
395 REM move red down
400 IF b(d)<c THEN PRINT INK
k; AT b(d),d; w$: LET b(d)=b(d)+1:
GO SUB 500
410 IF b(d)>c THEN PRINT INK
k; AT b(d),d; w$: LET b(d)=b(d)-1:
GO SUB 500
415 RETURN
417 REM move blue across
420 IF a(c)<d THEN PRINT INK
k; AT c,a(c); w$: LET a(c)=a(c)+1:
GO SUB 600
430 IF a(c)>d THEN PRINT INK
k; AT c,a(c); w$: LET a(c)=a(c)-1:
GO SUB 600
440 RETURN
490 REM test for a hit
500 IF ATTR (b(d),d)=59 THEN P
RINT AT b(d),d; "A": GO TO 1000
510 PRINT INK 2; AT b(d),d; "A"
530 RETURN
590 REM test for a hit
600 IF ATTR (c,a(c))=59 THEN P
RINT AT c,a(c); "A": GO TO 1000
610 PRINT INK 1; AT c,a(c); "A"
630 RETURN
690 REM test for a win
700 PRINT AT 21,0; "YOU'VE WON -
Another game ? Y/N"
760 FOR v=24 TO 36
765 BEEP .05,v: BEEP .05,v: BEE
P .05,v:
767 NEXT v
770 INPUT x$
780 IF x$="y" THEN GO TO 10
790 GO TO 1040
800 RETURN
990 REM HIT
1000 PRINT INK 3; OVER 1; AT c,d
; "C"
1010 PRINT FLASH 1; AT 21,0; "YOU
'RE DEAD-Another game Y/N"
1013 FOR v=1 TO 12
1015 BEEP .05,v: BEEP .05,v: BEE
P .05,v:
1017 NEXT v
1020 INPUT x$
1030 IF x$="y" THEN GO TO 10
1040 STOP

```



# DOMEWARS

ON AN ALIEN planet a missile is about to be launched at earth. Time is short, and you must run the gauntlet of the alien defences to bomb the domes in which the evil creatures live.

Stuart Box of Thame in Oxfordshire has used an unusual graphics routine to create some spectacular scenery for **Domewars**, which runs on the 48K Spectrum.

*The game uses our special abbreviations for graphics instructions, so please refer to the first page of Program Printout for advice on how to enter them before you type in the program.*

```

1 BORDER 0
2 CLEAR 65023
3 LET C=43
4 LET R=C*8
5 LET N=65367-R
6 LET F=35-32
7 LET D=F*8
8 LET H=N+1-D-256
9 LET E=H-256*INT (H/256)
10 PAPER 0: CLS : LET T=251: P
  RINT AT 1,12: INK 6: INVERSE 1: "
  SAUCER":#0;"(4*sp)WRITTEN BY STU
  ART BOX."
11 INK.6: PRINT AT 3,1;"YOU MO
  VE YOUR FLYING SAUCER(5*sp)AROUN
  D USING THESE KEYS:-(50*sp)Q=LEF
  T(26*sp)W=RIGHT(25*sp)E=DOWN(26*
  sp)R=UP(28*sp)T=FIRES"
12 PRINT AT 11,12;"P=PAUSE";AT
  12,0;"(PRESS ANOTHER KEY TO CON
  TINUE)";AT 13,12;"M=QUIT"
13 PRINT AT 17,1;"YOU CAN PRES
  S MORE THAN ONE KEY AT A TIME WH
  ICH MEANS YOU CAN(3*sp)MOVE DIAG
  ONALLY."
14 PRINT AT 21,10;"PLEASE WAIT
  "
```

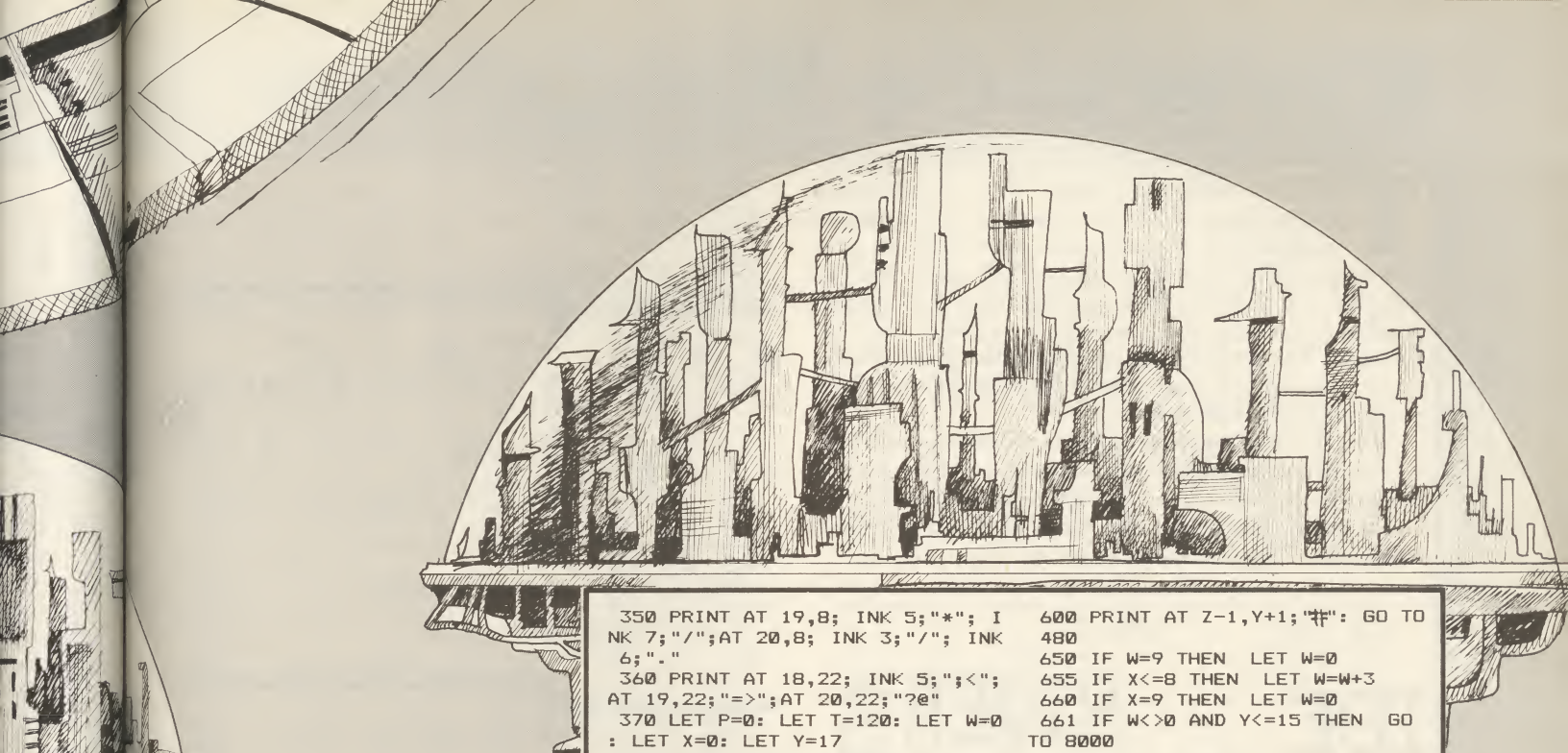
```

15 LET T=INT (H/256)
20 FOR I=N+1 TO N+R: READ A: P
  OKE I,A: NEXT I
35 DATA 0,0,0,0,0,0,0,0
36 DATA 255,255,255,129,129,25
  5,255,255
37 DATA 0,0,0,0,0,0,0,3
38 DATA 0,0,0,0,7,56,192,0
39 DATA 0,0,0,0,224,28,3,0
40 DATA 0,0,0,0,0,0,0,192
41 DATA 4,8,16,16,32,32,64,64
42 DATA 32,33,255,255,153,153,
  255,255
43 DATA 0,0,0,224,228,252,63,6
  3
44 DATA 32,16,8,8,4,4,2,98
45 DATA 64,79,143,153,153,159,
  159,159
46 DATA 255,255,153,153,255,22
  7,227,227
47 DATA 255,231,231,255,153,15
  3,255,255
48 DATA 0,60,66,66,98,98,98,60
49 DATA 0,8,8,8,12,12,12,12
50 DATA 0,124,2,2,60,96,96,62
51 DATA 0,124,2,2,60,6,6,126
52 DATA 0,64,96,100,100,126,4,
  4
53 DATA 0,62,64,64,60,6,6,126
54 DATA 0,62,64,64,124,70,70,1
  26
55 DATA 0,120,8,8,12,12,12,12
56 DATA 0,60,66,66,60,70,70,60
57 DATA 0,60,66,66,60,6,6,126
```

```

58 DATA 98,226,225,49,49,241,2
  41,241
59 DATA 0,0,0,0,1,2,4,8
60 DATA 0,0,0,0,128,64,32,16
61 DATA 8,11,11,11,8,8,8,11
62 DATA 16,208,208,208,16,16,1
  6,16
63 DATA 11,24,40,72,143,137,14
  5,251
64 DATA 16,216,212,18,241,145,
  137,223
65 DATA 0,0,0,0,0,1,1,15
66 DATA 0,0,0,126,129,56,56,16
67 DATA 0,0,0,0,0,128,128,240
68 DATA 63,109,118,63,15,0,0,0
69 DATA 255,182,219,255,255,0,
  0,0
70 DATA 252,222,110,252,240,0,
  0,0
71 DATA 0,36,24,60,60,24,0,0
72 DATA 255,255,126,126,60,24,
  24,0
73 DATA 24,24,24,24,24,24,24,2
  4
74 DATA 34,62,28,8,127,93,20,5
  4
75 DATA 192,240,248,255,255,24
  8,240,192
76 DATA 3,15,31,255,255,31,15,
  3
77 DATA 15,31,48,96,199,135,0,
  0
210 PRINT #0;"(2*sp)PRESS ANY K
  EY TO CONTINUE"
220 PAUSE 0
230 CLS
235 PRINT AT 3,11: INVERSE 1;"T
  HE GAME"; INVERSE 0;AT 5,1;"YOU
  HAVE TO BOMB THE DOMES(6*sp)BEFO
  RE THE TIME RUNS OUT. IF(4*sp)TH
  E TIME DOES RUN OUT THE(7*sp)MIS
  SILE LAUNCHES AT EARTH !!!!!"
240 PRINT AT 1,12: INVERSE 1;"S
  AUCCER"; INVERSE 0;AT 10,1;"TO MA
  KE IT EVEN HARDER THERE(4*sp)ARE
  ALSO GUN TURRETS THAT FIRE(2*sp
  )AT YOU, SO YOU HAVE TO AVOID(4*
  sp)BEING SHOT."
250 PRINT AT 16,1;"YOUR SCORE G
  OES UP TEN WHEN YOU HIT A DOME."
260 PRINT #0;"(2*sp)PRESS ANY K
  EY TO CONTINUE"
300 PAUSE 0: CLS
301 PRINT AT 1,12: INVERSE 1;"W
  ARNING";AT 3,1: INVERSE 0;"DO NO
  T BREAK INTO THIS PROGRAM(2*sp)U
  SING THE BREAK KEYS. INSTEAD(3*
  sp)PRESS 0."
302 PRINT #0;"(4*sp)PRESS ANY K
```





49,241,2  
8  
32,16  
8,11  
16,16,1  
3,137,14  
241,145,  
15  
56,56,16  
128,240  
15,0,0,0  
5,255,0,  
2,240,0,  
24,0,0  
6,60,24,  
24,24,2  
93,20,5

5,255,24  
5,31,15,  
9,135,0,  
SS ANY K  
RSE 1;"T  
1;"YOU  
(sp)BEFO  
(4\*sp)TH  
(7\*sp)MIS  
!!!!"  
RSE 1;"S  
1;"TO MA  
(3\*sp)ARE  
RE(2\*sp  
VOID(4\*  
SCORE G  
A DOME."  
SS ANY K  
RSE 1;"W  
0;"DO NO  
(2\*sp)U  
EAD(3\*s  
SS ANY K

EY TO PLAY."

```
303 PAUSE 0
304 LET S=0
305 CLS : POKE 23606,232
310 POKE 23607,252
320 BEEP .01,0: FOR Z=0 TO 8: P
RINT AT Z,0;"$";AT Z,31;"$";
T Z,25;"L$";NEXT Z: POKE 2
3606,0: POKE 23607,60: PRINT AT
3,2;"SCORE="
321 PRINT AT 5,2;"TIME=": POKE
23606,232: POKE 23607,252
325 PRINT AT 21,0;"$";FOR Z=0 T
O 20: PRINT AT Z,0;"$";AT Z,31;"$";
NEXT Z
326 PRINT AT 17,30;"L": FOR Z=1
6 TO 20: PRINT AT Z,16;"$";NEXT
Z: PRINT AT 17,17;"K";AT 17,19;
INK 4;"MMMMMMMMMM"
327 INK 6: PRINT AT 9,3;"H(2*H)
H(2*H)H(2*H)H"
328 PRINT AT 15,30;"L";AT 17,15
;"L"
329 PRINT AT 10,1;"K";AT 10,30;
;"L"
330 PRINT AT 18,2; INK 4;"%&'("
;AT 18,7;"%&'(";AT 19,2;"");AT 1
9,5;"";AT 19,7;"");AT 19,10;"";
;AT 20,2;"-";AT 20,5;"-";AT 20,7
;"-";AT 20,10;"-";
340 PRINT AT 19,3; INK 6;"*"; I
NK 5;"+";AT 20,3; INK 7;"-"; INK
```

```
350 PRINT AT 19,8; INK 5;"*"; I
NK 7;"-";AT 20,8; INK 3;"-"; INK
6;"-";
360 PRINT AT 18,22; INK 5;"<";
AT 19,22;"=";AT 20,22;"?"
370 LET P=0: LET T=120: LET W=0
: LET X=0: LET Y=17
400 IF IN 64510=247 THEN PRINT
AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET X=X-1
410 IF IN 64510=251 THEN PRINT
AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET X=X+1
420 IF IN 64510=253 THEN PRINT
AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET Y=Y+1
430 IF IN 64510=254 THEN PRINT
AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET Y=Y-1
440 IF IN 64510=250 THEN PRINT
AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET Y=Y-1: LET X=X+1
450 IF IN 64510=246 THEN PRINT
AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET Y=Y-1: LET X=X-1
460 IF IN 64510=245 THEN PRINT
AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET Y=Y+1: LET X=X-1
470 IF IN 64510=249 THEN PRINT
AT X,Y;"(3*#)";AT X+1,Y;"(3*#)"
: LET Y=Y+1: LET X=X+1
471 IF INKEY$="P" OR INKEY$="F"
THEN BORDER 4: PAUSE 0: PAUSE
0: BORDER 0
472 IF INKEY$="M" OR INKEY$="M"
THEN GO TO 8000
473 IF INKEY$="0" THEN POKE 23
606,0: POKE 23607,60: STOP
475 IF IN 64510=239 THEN GO TO
510
476 IF W<0 AND X<0 THEN LET X
=0
477 IF Y<1 THEN LET Y=1
478 IF Y>28 THEN LET Y=28
480 PRINT AT X,Y;"ABC";AT X+1,Y
;"DEF"
481 PRINT AT 3,8;S;AT 5,8;T;"#";
482 IF T=0 THEN GO TO 800
483 LET T=T-1
485 IF P=8 THEN GO TO 305
490 GO TO 650
500 GO TO 400
510 FOR Z=X+3 TO 20
520 IF SCREEN$ (Z,Y+1)<>"#" THE
N GO TO 550
525 PRINT AT Z-1,Y+1;"#"
530 PRINT AT Z,Y+1; INK 5;"G"
540 NEXT Z: GO TO 600
550 IF SCREEN$ (Z,Y+1)="#" THEN
GO TO 600
555 IF SCREEN$ (Z,Y+1)="M" THEN
GO TO 600
560 IF SCREEN$ (Z,Y+1)="K" THEN
GO TO 600
565 IF SCREEN$ (Z,Y+1)="L" THEN
GO TO 600
570 PRINT AT Z-1,Y+1;"#": NEXT
Z: LET S=S+10: LET P=P+1
```

```
600 PRINT AT Z-1,Y+1;"#": GO TO
480
650 IF W=9 THEN LET W=0
655 IF X<8 THEN LET W=W+3
660 IF X=9 THEN LET W=0
661 IF W<0 AND Y<15 THEN GO
TO 8000
662 IF W<0 AND Y>23 THEN GO
TO 8000
670 IF W>0 THEN PRINT AT W-1,1
6; INK 3;"MMMMMMMMMM": BEEP .15,3
: GO SUB 700
675 IF W=0 THEN GO SUB 750
680 GO TO 400
700 IF X=W-1 OR X+1=W-1 THEN G
O TO 8000
710 PRINT AT W-1,16; INK 0;"(9*
#)"
720 RETURN
750 LET L=INT (RND*16+1)
751 IF X=10 OR X=9 THEN GO TO
900
752 IF X=16 THEN GO TO 950
753 IF X=14 OR X=15 THEN GO SU
B 930
755 IF L>=5 THEN RETURN
756 LET V=L+L+L
760 FOR Q=11 TO 16: PRINT AT Q,
V; INK 4; INK 4;"I": NEXT Q: BEE
P .05,9
765 IF V=Y OR V=Y+1 OR V=Y+2 TH
EN GO TO 8000
770 FOR Q=11 TO 16: PRINT AT Q,
V; INK 0;"#": NEXT Q
780 RETURN
800 PRINT AT 17,18;"(12*#)"
810 FOR Z=0 TO 10: BEEP .1,9: N
EXT Z: FOR Z=0 TO 18: PRINT AT 1
7-Z,22; INK 5;"<";AT 18-Z,22;"="
>";AT 19-Z,22;"?"e";AT 20-Z,22;"#";
BEEP .05,5: BEEP .05,8: BEEP
.05,3: NEXT Z
820 GO TO 8000
900 PRINT AT 10,2; INK 5;"MMMM
MMMMMMMMMM";AT 10,25;"MMMMM": IF
Y<15 THEN GO TO 8000
910 IF Y>23 THEN GO TO 8000
920 BEEP .1,0: PRINT AT 10,2;"(
14*#)";AT 10,25;"(5*#)": GO TO 4
00
930 PRINT AT 15,15; INK 5;"MMMM
MMMMMMMMMMMMMM"
935 BEEP .1,0: IF Y>=13 THEN G
O TO 8000
940 PRINT AT 15,15;"(15*#)": RE
TURN
950 PRINT AT 17,1; INK 5;"MMMM
MMMMMMMMMM": BEEP .1,0
8000 BEEP .1,1: BEEP .1,2: BEEP
.1,3: BEEP .1,2: BEEP .1,1: PRIN
T AT X,Y; INK 6; FLASH 1;"ABC";A
T X+1,Y;"DEF"
8020 POKE 23606,0
8030 POKE 23607,60
8040 BORDER 1: PRINT #0;"(10*sp)
GAME(3*sp)OVER(11*sp)"
8050 BORDER 0: FOR C=0 TO 75: NE
XT C: GO TO 302
```



# Riverside Kingdom

**T**IME AGAIN to sharpen your wits and take up the reins of power to organise the affairs of a kingdom. In **Riverside Kingdom** you must decide on suitable employment for your people, to keep them well-fed and protected from bandits and natural disaster. A special problem is flooding, and you must try to build dykes to prevent it. The screen display will show how much water is on the land and how much dyke is built; ideally you should build more dyke than there is water.

The initial stages are very difficult to survive as you have little defence against a bad year, but persevere and soon you will find it possible to plan for disaster more intelligently.

The game was written for the 16K ZX-81 by Colin Hunniford of Berkhamsted in Hertfordshire.

```

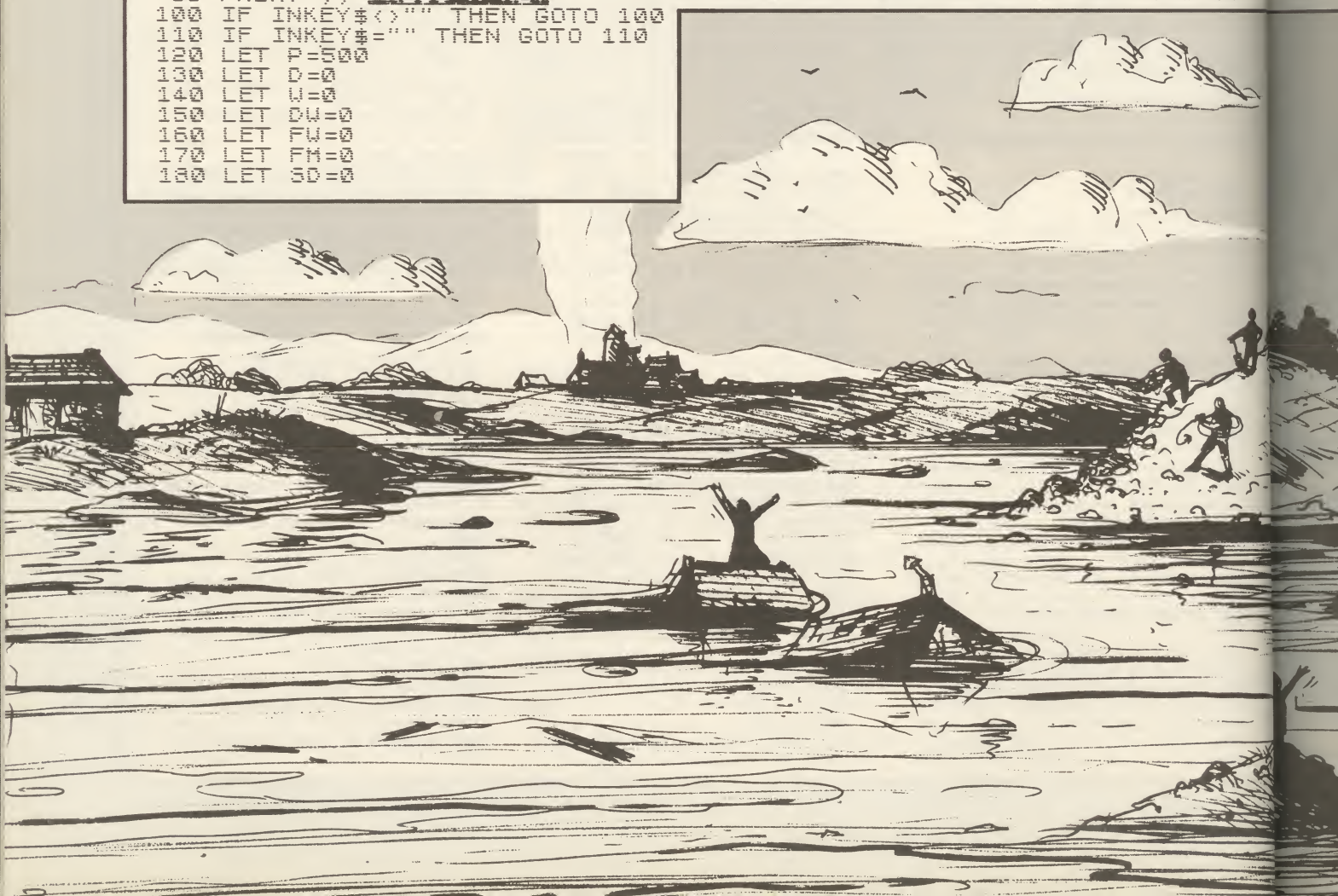
10 SLOW
20 RAND
30 CLS
40 PRINT "
IDE RIVERS
OM KINGD
50 PRINT
60 PRINT "
70 PRINT "
80 PRINT "YOU ARE THE KING O
F A SMALL LAND BY THE GREAT YE
LLO RIVER." " YOU START WITH
500 PEOPLE AND YOU MUST DECIDE H
OW MANY FARMERS AND DIKE WORKER
S ETC... THERE SHOULD BE 30 AS
TO ENSURE THE EXISTENCE OF
YOUR PEOPLE"
90 PRINT "PRESS A KEY"
100 IF INKEY$("<") THEN GOTO 100
110 IF INKEY$=" " THEN GOTO 110
120 LET P=500
130 LET D=0
140 LET U=0
150 LET DW=0
160 LET FW=0
170 LET FM=0
180 LET SD=0

```

```

190 LET DEAD=0
200 LET Y=0
210 LET B#=""
220 CLS
230 LET Y=Y+1
240 PRINT "
250 PRINT "PEOPLE:";P;TAB 31;"
"Y;TAB 31;"
260 PRINT "DIKE
";D;"WATER ";U;TAB 31;"
270 PRINT "TAB 31;"
280 PRINT "DIKE WORKERS ";DW;
TAB 31;"
290 PRINT "FARM WORKERS ";FW;
TAB 31;"
300 PRINT "FISHERMEN ";FM;
TAB 31;"
310 PRINT "SOLDIERS ";SD;
TAB 31;"
320 PRINT "
330 IF P<1 THEN GOTO 760
340 PRINT AT 20,0;"HOW MANY DIK
E WORKERS ?"
350 INPUT A
360 IF A>P THEN GOTO 340
370 LET DW=INT A
380 PRINT AT 7,15;DW;B#( TO LEN
B#-LEN STR$ DW)
390 PRINT AT 20,0;"HOW MANY FAR
M WORKERS ?"
400 INPUT A
410 IF A>P-DW THEN GOTO 390
420 LET FW=INT A
430 PRINT AT 8,15;FW;B#( TO LEN
B#-LEN STR$ FW)
440 PRINT AT 20,0;"HOW MANY FIS
HERMEN ?"
450 INPUT A
460 IF A>P-(DW+FW) THEN GOTO 44

```





```

0
470 LET FM=INT A
480 PRINT AT 9,15;FM;B$( TO LEN
B$-LEN STR$ FM)
490 LET SD=P-(DW+FW+FM)
500 PRINT AT 10,15;SD;B$( TO LE
N B$-LEN STR$ SD)
510 PRINT AT 20,0;"
"
520 LET BI=0
530 LET D=D+INT (DW/10)-INT (RN
D*U)
540 IF D>100 THEN LET D=100
550 IF D<0 THEN LET D=0
560 LET B=INT (RND*(1.9*P))
570 PRINT AT 14,0;
580 IF (FW*1.9+FM*1.5)<P THEN G
OSUB 950
590 IF (FW*1.9+FM*1.5)>P THEN G
OSUB 1040
600 IF B<SD THEN LET B=0
605 IF B THEN LET B=B-SD
610 LET DEAD=0
620 IF B THEN GOSUB 1070
640 PRINT DEAD;(" PEOPLE" AND D
EAD<>1);(" PERSON" AND DEAD=1);"
KILLED BY BANDITS"
650 IF U>D THEN GOSUB 780
660 IF U<5 THEN GOSUB 870
670 LET U=INT (RND*101)
675 LET DEAD=P-(DW+FW+FM+SD)
680 LET P=P-DEAD
690 PRINT BI;(" CHILDREN" AND B
I<>1);(" CHILD" AND BI=1);" BORN "
700 LET P=P+BI
710 IF P<0 THEN LET P=0
720 PRINT "PRESS A KEY"
730 IF INKEY$<>"" THEN GOTO 730
740 IF INKEY$="" THEN GOTO 740
750 GOTO 220
760 PRINT "YOUR PEOPLE HAVE G
OTTEN TOUGH LUCK"
770 STOP

```

```

780 LET Z=DW+FW+FM+SD
790 LET X=(U-D)/100
800 LET DW=INT (DW-(X*DW))
810 LET FW=INT (FW-(X*FW))
820 LET FM=INT (FM-(X*FM))
830 LET SD=INT (SD-(X*SD))
840 PRINT Z-(DW+FW+FM+SD);(" PE
OPLE" AND Z-(DW+FW+FM+SD)<>1);("
PERSON" AND Z-(DW+FW+FM+SD)=1);
" KILLED BY FLOOD"
850 LET DEAD=P-(DW+FW+FM+SD)
860 RETURN
870 LET Z=DW+FW+FM+SD
880 LET DW=DW-INT (RND*DW/1.2)
890 LET FW=FW-INT (RND*FW/1.2)
900 LET FM=FM-INT (RND*FM/1.2)
910 LET SD=SD-INT (RND*SD/1.2)
920 PRINT Z-(DW+FW+FM+SD);(" PE
OPLE" AND Z-(DW+FW+FM+SD)<>1);("
PERSON" AND Z-(DW+FW+FM+SD)=1);
" KILLED BY DROUGHT"
930 LET DEAD=P-(DW+FW+FM+SD)
940 RETURN
950 LET X=(P-(FW*1.9+FM*1.5))/P
960 LET Z=DW+FW+FM+SD
970 LET DW=DW-INT (DW*X)
980 LET FW=FW-INT (FW*X)
990 LET FM=FM-INT (FM*X)
1000 LET SD=SD-INT (SD*X)
1010 PRINT Z-(DW+FW+FM+SD);(" PE
OPLE" AND Z-(DW+FW+FM+SD)<>1);("
PERSON" AND Z-(DW+FW+FM+SD)=1);
" KILLED BY FAMINE"
1020 LET DEAD=P-(DW+FW+FM+SD)
1030 RETURN
1040 LET X=(FW*1.9+FM*1.5)-P
1050 LET BI=INT X
1060 RETURN
1070 LET Z=DW+FW+FM+SD
1080 IF B>DW THEN LET DW=INT (RN
D*DW)
1090 IF B>FW THEN LET FW=INT (RN
D*FW)
1100 IF B>FM THEN LET FM=INT (RN
D*FM)
1110 IF B>SD THEN LET SD=INT (RN
D*SD)
1120 LET DEAD=Z-(DW+FW+FM+SD)
1130 RETURN
9997 STOP
9998 SAVE "KING"
9999 RUN

```





**T**HE 3.30 EXPRESS is hurtling towards disaster. A yawning chasm waits where there used to be a bridge. It is your job, as pilot of a helicopter, to collect the pieces of bridge at the bottom of the chasm and put them back in place before the train thunders across. Unfortunately enemy helicopters and bombs impede your progress, and you must time your efforts carefully to survive. **Rail Rescue** was written for the 16K Spectrum by C Thimbleby and B Knight of Lincoln.

*The game uses our special abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the game.*

```

10 REM Rail Rescue
30 FOR x=0 TO 7: READ a: POKE
USR "a"+x,a: NEXT x
40 DATA 255,56,120,249,255,255
,40,124
50 FOR x=0 TO 7: READ a: POKE
USR "b"+x,a: NEXT x
60 DATA 248,144,147,243,255,25
5,102,102
70 FOR x=0 TO 7: READ a: POKE
USR "c"+x,a: NEXT x
80 DATA 254,146,146,147,255,25
5,102,102
90 FOR x=0 TO 7: READ a: POKE
USR "d"+x,a: NEXT x
100 DATA 0,28,16,56,124,124,124
,56
110 FOR x=0 TO 7: READ a: POKE
USR "e"+x,a: NEXT x
120 DATA 255,195,165,153,153,16
5,195,255
145 GO TO 3000
150 LET nb=0: LET ti=0: LET mi=
28: LET l=11: LET c=16: LET br=0
: LET li=4: LET sc=0
162 BORDER 1: INK 7: BRIGHT 0:
CLS
165 INK 0: PRINT AT 5,0;"EEEEEE
EE";AT 5,24;"EEEEEEEEEE": FOR f=6
TO 13: PRINT AT f,3;"E";AT f,28;
"E": NEXT f
170 INK 0: FOR f=0 TO 8: PLOT f
,0: DRAW 0,127: NEXT f: LET b=12
7: FOR a=8 TO 56: PLOT a,0: DRAW
0,b: LET b=b-INT (RND*5) AND b>
0: NEXT a
180 INK 0: FOR f=255 TO 247 STE
P -1: PLOT f,0: DRAW 0,127: NEXT
f: LET b=127: FOR a=247 TO 199
STEP -1: PLOT a,0: DRAW 0,b: LET
b=b-INT (RND*5) AND b>0: NEXT a
190 INK 0: BRIGHT 1: INVERSE 1:
PRINT AT 20,0;"(2*sp)TIME(3*sp)
:328pm(4*sp)SCORE(2*sp):000(2*sp)
";AT 21,0;"(19*sp)LIVES(2*sp):0
04(sp)"
195 INVERSE 0: BRIGHT 0

```

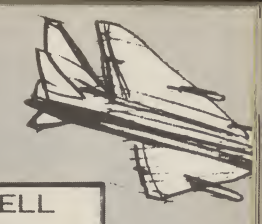
```

200 PRINT AT 19,8; INK 2;"EEEE
EEEEEEEEEE"
214 LET ac=8: LET ac1=23
215 PRINT AT 17,ac; INK 3;"A";A
T 18,ac1;"A";AT 6,ac;"A";AT 6,ac
1;"A";AT 10,ac;"D";AT 12,ac1;"D"
216 IF ATTR (1,c+1)=59 THEN LE
T li=li-1: FOR f=0 TO 5: FOR b=0
TO 7: BEEP .004,b: BORDER b: NE
XT b: NEXT f: BORDER 1
217 IF ATTR (1,c-1)=59 THEN LE
T li=li-1: FOR f=0 TO 5: FOR b=0
TO 7: BEEP .004,b: BORDER b: NE
XT b: NEXT f: BORDER 1
219 IF li<=0 THEN GO TO 2000
220 PRINT INK 1;AT 1,c;"A": IF
br=1 THEN PRINT AT 1+1,c;"E"
221 IF br=1 AND 1<=17 THEN PRI
NT AT 1+2,c;"(sp)": PRINT AT 1+1
,c+1;"(sp)";AT 1+1,c-1;"(sp)"
222 IF 1=6 AND br=1 AND ATTR (1
-1,c)<>56 THEN PRINT AT 1+1,c;"
(sp)";AT 1-1,c;"E": LET br=0: LE
T nb=nb+1: LET sc=sc+40
224 IF ATTR (1+1,c)=58 THEN LE
T br=1: LET sc=sc+20
240 IF INKEY$="o" AND c>8 THEN
PRINT AT 1,c;"(sp)": LET c=c-1
250 IF INKEY$="p" AND c<23 THEN
PRINT AT 1,c;"(sp)": LET c=c+1
260 IF INKEY$="q" AND 1>6 THEN

```







```

PRINT AT 1,c;"(sp)": LET l=1-1
270 IF INKEY$="a" AND l<18 THEN
  PRINT AT 1,c;"(sp)": LET l=l+1
275 IF nb=16 THEN GO TO 1000
280 PRINT AT 17,ac;"(sp)": AT 18
,ac1;"(sp)": AT 6,ac;"(sp)": AT 6,
ac1;"(sp)": AT 10,ac;"(sp)": AT 12
,ac1;"(sp)": LET ac=ac+1: LET ac
l=ac1-1: IF ac=23 THEN GO TO 21
4: IF ac1=8 THEN GO TO 214
290 PRINT INVERSE 1: BRIGHT 1:
  INK 0; AT 21,29; li; AT 20,28; sc; A
T 20,11; mi
300 LET ti=ti+1: IF ti=254 THEN
  LET mi=mi+1: IF mi=30 AND nb<1
6 THEN GO TO 2000
301 IF ti=504 THEN LET mi=mi+1
: IF mi=30 AND nb<16 THEN GO TO
2000
305 IF mi<=30 AND nb=16 THEN G
O TO 1000
310 GO TO 215
1000 LET a$="CCCCCB": FOR f=0 TO
26: PRINT AT 4,f; INK 4;a$; AT 4
,f-1;"(sp)": BEEP .01,-20: BEEP
.01,-20: BEEP .01,-5: NEXT f: PR
INT AT 4,26;"(6*sp)"

```

```

1010 PRINT INK 1; AT 2,11; "WELL
DONE,"; AT 3,3; " YOU HAVE SAVED T
HE TRAIN"; AT 4,6; INK 2; "YOU SCO
RED ";sc;" POINTS"
1020 PAUSE 0: GO TO 3000
2000 LET a$="CCCCCB": FOR f=0 TO
  8: PRINT AT 4,f; INK 1;a$; AT 4,
  f-1;"(sp)": BEEP .01,-20: BEEP .
  01,-20: BEEP .01,-5: NEXT f: PRI
  NT AT 4,26;"(6*sp)": FOR n=5 TO
  18: PRINT AT n,8; INK 1;a$: BEEP
  .05,10-n: PRINT AT n-1,8;"(6*sp
  )": NEXT n
2005 FOR s=-20 TO -30 STEP -1: B
  EEP .01,s: NEXT s
2010 PRINT AT 2,12; INK 1;"BAD L
  UCK,"; AT 3,5; "YOU FAILED YOUR MI
  SSION"; AT 4,6; INK 2; "YOU SCORED
  ";sc;" POINTS"
2020 PAUSE 0: GO TO 3000
3000 CLS : BORDER 1: BRIGHT 1: P
  APER 7: CLS
3010 PRINT AT 1,11; INK 2;"RAIL
  RESCUE"; AT 2,9; INK 1;"ECLIPSOFT
  1984"
3020 PRINT AT 5,0;"THE OBJECT OF
  THE GAME IS TO FLY""AROUND THE
  VALLEY FETCHING PARTS""OF A BR
  IDGE AND TO REBUILD IT.""ONLY Y
  OU MUST DODGE THE""HELICOPTERS
  AND BOMBS.YOU MUST""COMPLETE TH
  E BRIDGE BEFORE""3:30PM,A TIME
  OF TWO MINUTES,.""OTHERWISE THE
  3:30 EXPRESS WILL""PLUNGE INTO
  THE DEPTHS OF THE""VALLEY."
3030 PRINT AT 15,1; INK 3;"CONTR
  OLS:"; INK 2; AT 16,1;"UP....Q"; A
  T 17,1;"DOWN..A"; AT 18,1;"LEFT..
  O"; AT 19,1;"RIGHT.P"
3040 PRINT FLASH 1; INK 0; AT 20
  ,9;"PRESS ANY KEY": PAUSE 0: GO
  TO 149

```

# RAIL RESCUE





```

2 REM Home Accounts
3 GO TO 8400
10 CLS : PRINT AT 1,7;"Monthly
forecast.": PRINT AT 1,7; OVER
1;"-----"
20 PRINT AT 3,11;"MONTHLY": PR
INT AT 6,6;"INCOME": PRINT AT 6,
17;"OUTGOING"
30 PLOT 107,142: DRAW -40,-14:
PLOT 124,142: DRAW 40,-14
40 LET a(1,1)=a(1,5): PRINT AT
8,6;"£";a(1,1)
50 LET a(1,2)=a(1,4)+a(2,1)+a(
2,3)+a(2,5)+a(3,1)+a(3,3): PRINT
AT 8,17;"£";a(1,2)
55 LET a(1,3)=a(1,1)-a(1,2): I
F SGN a(1,3)=-1 THEN LET f1=1
60 PRINT AT 10,11; INK f1+1; F
LASH f1;"BALANCE"
70 PRINT AT 12,11; INK f1+1;"£
";a(1,1)-a(1,2): LET f1=0
80 PAUSE 0
90 RETURN
1000 CLS : PRINT AT 1,9;"Bank St
atement.": PRINT AT 1,9; OVER 1;
"-----": INPUT "Change
cheque start No.?(Y/N)";y$: IF
y$="y" THEN INPUT a(1,6)
1001 IF y$="Y" THEN INPUT a(1,6
)
1002 INPUT INK 0; PAPER 7;"View
or Input?(V/I)";i$: IF LEN i$>1
THEN GO TO 1001
1003 IF LEN i$<1 THEN GO TO 100
1
1004 IF i$="i" THEN LET qu=1: G
O TO 1500
1005 IF i$="I" THEN LET qu=1: G
O TO 1500
1006 IF i$="v" THEN GO TO 1500
1007 IF i$="V" THEN GO TO 1500
1009 GO TO 1001
1010 FOR f=4 TO 18 STEP 8: PRINT
AT f,1;"Cheque(3*sp)Date(5*sp)I
nformation(2*sp)": PRINT AT f,1;
OVER 1;"-----"
": NEXT f
1020 FOR f=8 TO 20 STEP 8: PRINT
AT f,1; INK 2;"Credit(3*sp)Debi
t(4*sp)Balance": PRINT AT f,1; I
NK 2; OVER 1;"-----"
": NEXT f
1030 PLOT 75,143: DRAW 0,-130: P
LOT 148,143: DRAW 0,-130: RETURN
1050 INPUT "Day ?";d$: IF LEN d$
>2 THEN GO TO 1050
1055 IF CODE d$>48 THEN IF CODE
d$<58 THEN LET a(j,1)=VAL d$:
PRINT AT 5,10;d$: GO TO 1060

```

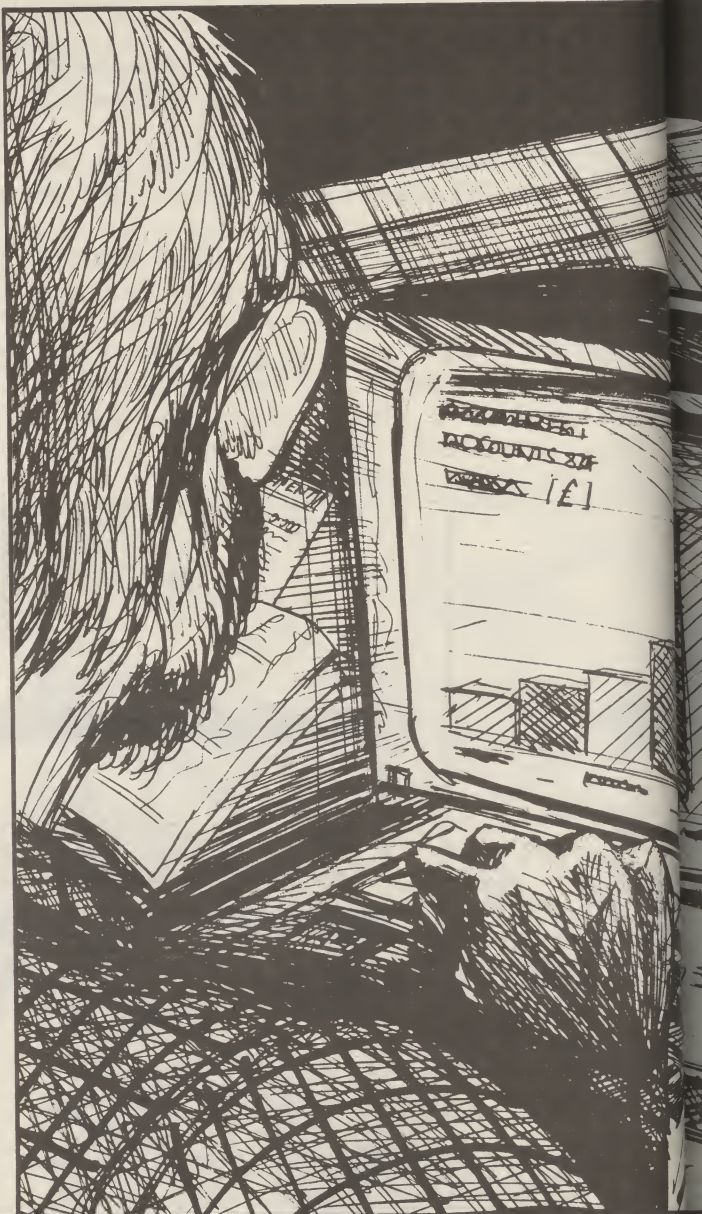
# Home Accounts

**H**OME ACCOUNTS should be of use to virtually any reader of *Sinclair User*. It is a comprehensive accounts system to help manage the household budget, and was written by Stephen Hancock of Stoke-on-Trent.

There are three main facilities, monthly forecast, cash expenditure and bank account. The monthly forecast works in conjunction with the cash expenditure to set expenditure against income. To use the monthly forecast move the cursor with keys 6 and 8 to the desired item, and then press key 8 to alter the figures.

To exit from the cash expenditure routine, use any key except 0 or ENTER. The bank account section is independent of the other two and can store details of up to 400 cheques. You can increase this number by altering the first two DIM statements in line 8 from 400 to the desired number, up to about 1,350.

The program requires a 48K Spectrum, and uses our special abbreviations for graphics characters, so please read the instructions on the first page of the Program Printout section before typing in the listing.





```

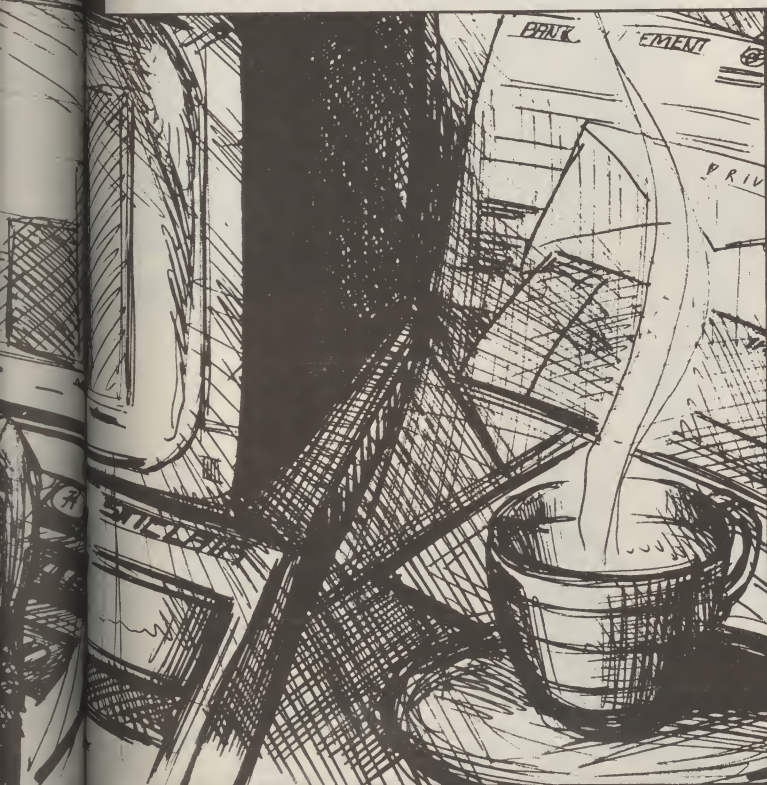
1056 GO TO 1050
1060 INPUT "Month ?";d$: IF LEN
d$>2 THEN GO TO 1060
1065 IF CODE d$>48 THEN IF CODE
d$<58 THEN LET a(j,2)=VAL d$:
PRINT AT 5,13;d$: GO TO 1070
1066 GO TO 1060
1070 INPUT "Year ? ";d$: IF CODE
d$>48 THEN IF CODE d$<58 THEN
GO TO 1076
1075 GO TO 1070
1076 IF LEN d$>4 THEN GO TO 107
0
1077 IF LEN d$>3 THEN LET d$=d$
(3 TO 4): GO TO 1079
1078 IF LEN d$>2 THEN LET d$=d$
+" "
1079 PRINT AT 5,16;d$: LET a(j,3
)=VAL d$
1080 INPUT "Information ?";i$: I
F LEN i$>11 THEN PRINT AT 3,0;
INK 2; FLASH 1;"(3*sp)TOO LONG 1
1 CHARACTERS MAX.(2*sp)": GO TO
1080
1090 PRINT AT 3,0;"(32*sp)"
1095 IF LEN i$<11 THEN LET i$=i
$+"(sp)": GO TO 1095
1100 FOR f=1 TO 11: LET a$((j-5)
,f)=i$(f TO f): PRINT AT 5,18+f;
i$(f TO f): NEXT f
1110 INPUT "CREDIT OR DEBIT ? (C
/D)";g$: IF g$="d" THEN LET deb
=-1
1120 IF g$="D" THEN LET deb=-1
1130 INPUT "AMOUNT ? ";s$: IF CO
DE s$>48 THEN IF CODE s$<58 THE

```

```

N IF LEN s$<7 THEN LET amo=VAL
s$: GO TO 1135
1131 GO TO 1130
1135 IF deb=-1 THEN LET amo=amo
*deb: PRINT AT 9,10; INK 4;amo:
GO TO 1150
1140 PRINT AT 9,1;amo
1150 LET a(j,4)=amo
1160 GO SUB 7400: IF SGN a(j,5)=
-1 THEN LET f1=1
1170 PRINT AT 9,19; INK f1+1; FL
ASH f1;a(j,5): LET f1=0
1490 LET deb=1: LET qu=0
1491 INPUT "CONTINUE OR RETURN T
O MENU ?(4*sp)(C/R)(sp)";1$: IF
1$="c" THEN GO TO 1495
1492 IF 1$="C" THEN GO TO 1495
1493 RETURN
1495 CLS : PRINT AT 1,9;"Bank St
atement.": PRINT AT 1,9; OVER 1;
"
-----"
1496 LET qu=1
1500 GO SUB 1010
1510 INPUT INK 0; PAPER 7;"Cheq
ue No.?" ;k$: IF LEN k$>6 THEN G
O TO 1510
1520 IF LEN k$<1 THEN GO TO 151
0
1530 IF CODE k$>48 THEN IF CODE
k$<58 THEN GO TO 1540
1535 GO TO 1510
1540 LET chq=VAL k$
1545 IF chq<a(1,6) THEN GO TO 1
510
1546 LET j=(chq-a(1,6))+6
1547 IF j>400 THEN GO SUB 7900
1548 IF qu=1 THEN IF a(j,1)>0 T
HEN INPUT "Cheque used. CONTINU
E ? (Y/N)(3*sp)";u$: IF u$="n" T
HEN RETURN
1549 IF u$="N" THEN RETURN
1550 PRINT AT 5,1;chq;AT 5,12;"/
";AT 5,15;"/";AT 13,1;chq+1;AT 1
3,12;"/";AT 13,15;"/"
1555 IF qu=1 THEN GO TO 1050
1560 PRINT AT 5,10;a(j,1);AT 5,1
3;a(j,2);AT 5,16;a(j,3)
1570 FOR f=1 TO 11:: PRINT AT 5,
f+18;a$((j-5),f): NEXT f
1580 IF a(j,4)>0 THEN PRINT AT
9,1;a(j,4): GO TO 1600
1590 IF a(j,4)<0 THEN PRINT AT
9,10; INK 4;a(j,4)
1595 GO SUB 7400: IF SGN a(j,5)=
-1 THEN LET f1=1
1600 PRINT AT 9,19; INK f1+1; FL
ASH f1;a(j,5): LET f1=0
1610 LET j=j+1
1620 PRINT AT 13,10;a(j,1);AT 13
,13;a(j,2);AT 13,16;a(j,3)
1630 FOR f=1 TO 11: PRINT AT 13,

```





```

f+18;a$(j-5,f): NEXT f
1640 IF a(j,4)>0 THEN PRINT AT
17,1;a(j,4): GO TO 1660
1650 IF a(j,4)<0 THEN PRINT AT
17,10; INK 4;a(j,4)
1655 GO SUB 7400: IF SGN a(j,5)=
-1 THEN LET f1=1
1660 PRINT AT 17,19; INK f1+1; F
LASH f1;a(j,5): LET f1=0
1670 INPUT "CONTINUE OR RETURN T
O MENU ?(4*sp)(C/R)(sp)": IF
1$="c" THEN GO TO 1690
1680 IF 1$="C" THEN GO TO 1690
1685 RETURN
1690 CLS: PRINT AT 1,9;"Bank St
atement.": PRINT AT 1,9; OVER 1;
"
1700 GO TO 1500
2000 CLS: PRINT AT 1,3;"Probabl
e cash expenditure.": PRINT AT 1
,3; OVER 1;"
2010 PRINT AT 5,3;"ITEM";TAB 20;
"Expenditure";AT 5,3; OVER 1;"
2015 LET a(1,4)=a(4,3)+a(4,4)+a(
4,5)+a(4,6)+a(5,1)+a(5,2)+a(5,3)
+a(5,4)+a(5,5)+a(5,6)
2020 FOR f=1 TO 9: PRINT AT f+5,
2;f;")";TAB 20;"£": NEXT f: PRIN
T AT 15,1;"10";TAB 20;"£": PRIN
T AT 18,1;"TOTAL EXPENDITURE= £"
;a(1,4)
2021 FOR f=1 TO 10: FOR d=1 TO 1
5: PRINT AT f+5,d+4;b$(f,d): NEX
T d
2022 LET f=f+20: GO SUB 7700: PR
INT AT f-15,21;a(x,y): LET f=f-2
0: NEXT f
2025 PLOT 158,138: DRAW 0,-90
2030 PRINT AT 3,3;"Key 0 to alte
r items"
2040 PAUSE 0: IF INKEY$>"0" THEN
RETURN
2050 INPUT "ITEM No.?" :v$: IF CO
DE v$>48 THEN IF CODE v$<58 THE
N LET b=VAL v$: GO TO 2052
2051 GO TO 2050
2052 IF b<1 THEN PRINT AT 4,0;
INK 2; FLASH 1;"(9*sp)NUMBER TOO
SMALL(7*sp)": PAUSE 0: PRINT AT
4,0;"(32*sp)": GO TO 2050
2055 IF b>10 THEN PRINT AT 4,0;
INK 2; FLASH 1;"(9*sp)NUMBER TO
O LARGE(7*sp)": PAUSE 0: PRINT A
T 4,0;"(32*sp)": GO TO 2050
2060 INPUT "ITEM ?":h$: IF LEN h
$>15 THEN PRINT AT 4,0; INK 2;
FLASH 1;"(3*sp)TOO LONG 15 CHARA
CTERS MAX.(2*sp)": GO TO 2060
2070 IF LEN h$<16 THEN LET h$=h
$+"(sp)": GO TO 2070
2080 FOR f=1 TO 16: LET b$(b,f)=
h$(f TO f): NEXT f
2090 INPUT "EXPENDITURE?":exp: L
ET e$=STR$ exp: IF LEN e$>6 THEN
PRINT AT 4,0; INK 2; FLASH 1;"
(6*sp)TOO LONG MAX. 10 CHRS(5*sp
)": PAUSE 0: PRINT AT 0,4;"(32*sp
)": GO TO 2090
2100 LET b=b+2: IF b>6 THEN LET
b=b-6: LET g=1
2110 LET a(4+g,b)=exp
2997 LET g=0
2998 GO TO 2000
3000 CLS: PRINT AT 1,3;"Key in
average monthly(10*sp)expenditur
e on the following"
3010 PRINT #0;"To exit and see f
orecast press 5": LET a(3,5)=a(1
,5)-a(2,1)-a(2,3)-a(2,5)-a(3,1)-
a(3,3): RESTORE 9000: FOR f=5 TO
17 STEP 2: READ c$: PRINT AT f,
19;"(11*sp)": PRINT AT f,3;c$;AT
f,14;"- £"
3011 GO SUB 7700
3019 PRINT AT f,19;a(x,y)
3020 NEXT f
3030 PRINT AT xc,yc;">": PAUSE 1
0
3040 IF INKEY$="7" THEN LET xc=

```

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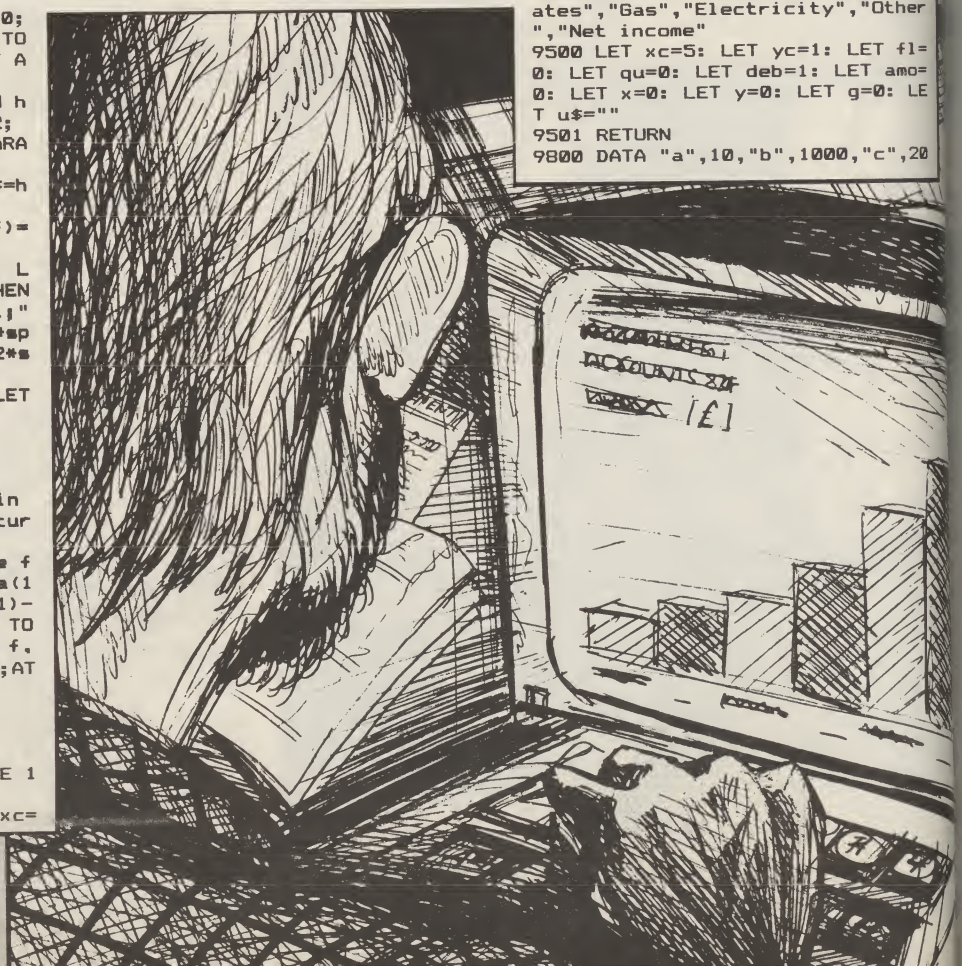
xc-2: PRINT AT xc+2,yc;"(sp)": I
F xc<5 THEN LET xc=xc+2
3050 IF INKEY$="6" THEN LET xc=
xc+2: PRINT AT xc-2,yc;"(sp)": I
F xc>15 THEN LET xc=xc-2
3060 IF INKEY$="8" THEN INPUT a
q: GO SUB 7800: GO TO 3010
3070 IF INKEY$="5" THEN GO TO y
3080 GO TO 3030
7400 FOR f=1 TO (j-6): IF a(j-f,
1)>0 THEN LET a(j,5)=a(j-f,5)+a
(j,4): RETURN
7410 NEXT f: LET a(j,5)=a(j,4):
RETURN
7700 IF f=24 THEN LET x=4: LET
y=6: RETURN
7705 IF f=30 THEN LET x=5: LET
y=6: RETURN
7710 LET x=INT (f/6)+1
7720 LET y=(f/6-INT (f/6))*6
7730 RETURN
7800 LET x=INT (xc/6)+1: LET y=(
xc/6-INT (xc/6))*6: LET a(x,y)=a
q: RETURN
7900 CLS: PRINT: PRINT "Sorry
this filing system cannot cope w
ith this amount of data.(2*sp)In
creasing capacity will clear(2*sp
p)files and lengthen data storag
e and retrieval times."
7901 PRINT "To increase: break
into the(4*sp)program and EDIT 1
ine 8400.Then extend the first a
nd second(5*sp)arrays by up to 9
50(extra).Also line 1547 will ne
ed to be(7*sp)altered accordingl
y by adding(3*sp)the same amount
on to the 400."
7902 INPUT INK 2; PAPER 7; FLAS
H 1;"BREAK ? (Y/N) ":n$: IF n$="
y" THEN STOP
7903 IF n$="Y". THEN STOP
7904 CLS: LET qu=0: GO TO 8401
8400 GO SUB 9500: DIM a(400,6):
DIM a$(400,11): DIM b$(10,16)
8401 PAPER 7: INK 0: BRIGHT 0: F
LASH 0: CLS: BORDER 1
8500 PRINT AT 1,5;"Home accounts
controler": PRINT AT 1,5; OVER
1;"
8510 PRINT AT 4,3;"a) Monthly fo
recast."

```

```

8520 PRINT AT 6,3;"b) Bank state
ment."
8530 PRINT AT 8,3;"c) Probable c
ash expenditure."
8540 PRINT AT 10,3;"d) Alter for
ecast."
8550 PRINT AT 12,3;"e) Save data
to tape.": PRINT AT 14,3;"f) Lo
ad data from tape."
8555 PRINT AT 16,3;"g) Reset pro
gram."
8556 PRINT AT 18,3;"h) Quit prog
ram."
8560 INPUT "Select option:-":o$
8570 RESTORE 9800: FOR f=0 TO 15
: READ q$,q: IF q$=o$ THEN GO S
UB q: GO TO 8401
8580 NEXT f: GO TO 8560
8900 SAVE "Banc Data" DATA a():
POKE 23736,181: PAUSE 60: SAVE "
Data (2)" DATA a$(): POKE 23736,
181: PAUSE 60: SAVE "Data (3)" D
ATA b$(): PRINT 0; FLASH 1;"Sto
p tape.Press any key.": PAUSE 0:
INPUT "VERIFY DATA ? (Y/N) ":s$
: IF s$="y" THEN GO TO 8930
8910 IF s$="Y" THEN GO TO 8930
8920 RETURN
8930 VERIFY "Banc Data" DATA a():
VERIFY "Data (2)" DATA a$(): V
ERIFY "Data (3)" DATA b$(): RETU
RN
8950 CLS: PRINT 0;"Start tape.
": LOAD "Banc Data" DATA a(): LO
AD "Data (2)" DATA a$(): LOAD "D
ata (3)" DATA b$(): PAUSE 5: CLS
: PRINT #0; FLASH 1;"Stop tape.
Press any key.": PAUSE 0: RETUR
N
8980 CLS: INPUT INK 2; PAPER 7
: FLASH 1;"Are you sure?(Y/N)":t
$: IF t$="y" THEN RUN
8981 IF t$="Y" THEN RUN
8982 RETURN
8990 CLS: INPUT INK 2; PAPER 7
: FLASH 1;"Are you sure?(Y/N)":t
$: IF t$="y" THEN RANDOMIZE USR
0
8991 IF t$="Y" THEN RANDOMIZE U
SR 0
8995 RETURN
9000 DATA "Income","Mortgage","R
ates","Gas","Electricity","Other
","Net income"
9500 LET xc=5: LET yc=1: LET f1=
0: LET qu=0: LET deb=1: LET amo=
0: LET x=0: LET y=0: LET g=0: LE
T u$=""
9501 RETURN
9800 DATA "a",10,"b",1000,"c",20

```





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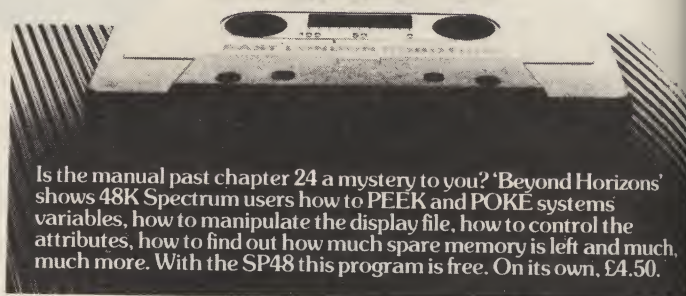
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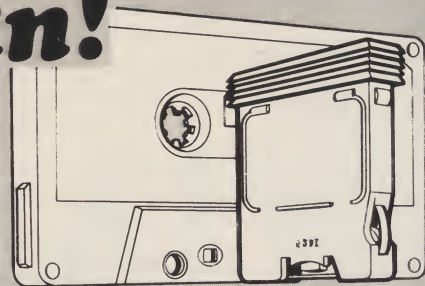
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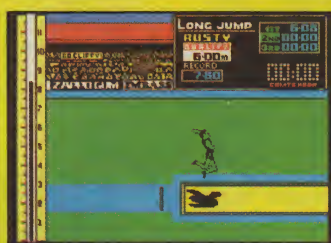
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# Adding commands to Spectrum Basic

Keith Williams presents a detailed explanation on how to use interrupts on the Spectrum and provides a useful trace function for printing program line numbers

ONE OF THE problems of adding new commands and routines to the Spectrum Basic is that it is held in ROM. That means that all the computer operations are under the control of an immutable program which cannot be stopped.

Although it is easy to write new routines they can only be called by means of a very user unfriendly RANDUSR call. Passing of information into and out of those routines is also difficult without a whole chain of pokes. Even then it may be impossible to get the routine to work as it may be needed at the execution of every line.

There is, however, one very simple way of beating the ROM and that is to use interrupts. While exploring this idea we can also develop a new command for the the Spectrum. If you are not interested in the detailed explanation you can still follow the instructions and load up the final program which gives a very useful trace function, an essential tool when debugging along Basic programs.

A trace function is a machine code routine which prints on screen, while a program is running, the number of the line which is currently being executed.

The Spectrum is based on the popular Z-80A microprocessor. On that microprocessor are two electrical connections which are involved with interrupts. The first is the NMI which is of little use to our present purposes and so we will ignore it. When the voltage applied to the other pin changes we say that an interrupt occurs. That causes the processor to stop what it is doing, make a note of where it has reached and then jump to follow another program called the interrupt service routine. When that is finished it returns to its place in the original program.

There are three interrupt modes available on the microprocessor. IM0 is designed for use with peripherals such as printers and the like. When the

peripheral needs servicing, such as requiring more information, then it sends the interrupt message and then an address. The computer, in IM0, will run the routine starting at that address before returning from the interrupt.

IM1 is the mode normally used by the Spectrum. When an interrupt occurs it will carry out the routine at address 56. That routine in the ROM does various housekeeping tasks such as

reading the keyboard. The Spectrum is wired in such a way that an interrupt comes with every fluctuation in the mains voltage, in Britain that occurs 50 times a second.

IM2 is much more useful. In that mode the processor jumps to a service routine the address of which must calculate from two numbers. The first of those numbers comes from the thing causing the interrupt. In a Spectrum this number 255 — or FF in Hex — is supplied by the hardware. The other number is programmed in. It is kept in a special store known as the I register. The processor jumps to the address  $256 \times I + 255$ . Just to make things more complicated this computed address is not the start address but is the address of a store holding the start address.

To get our program on the way we must first poke its start address into another address — whose Hex value is xxFF. Then we must put its vector address — the xx from before — into I. That sounds complicated but really it is simple. There is, however, one problem. The screen chip in the Spectrum works in such a way that putting the vector in the first 16K of RAM causes difficulties for the machine. If you want to use interrupt routines on a 16K machine you must be very devious. If you put 40 into the I register then the processor will look at  $40 \times 256 + 255 = 10495$  for a start address. That is in ROM and it contains the start address 32348 or 7E5C in Hex. On the 48K Spectrum you have more leeway and can either use the 16K trick or use the number 128 (80 Hex) in I.

And so to the routines. A word first about getting them into memory. If you have an assembler then it is easy. If you do not then you will need a **Hexloader** program. One is provided in listing 1. You must first type it in and then save it. It enables you to type in the machine code and then save that.

When entering the machine code routines in listing 2 type in only the digits

## Listing 1: Hexloader

```

5 DEF FN z$(n)=z$(n+1)
10 DEF FN a(x$)=CODE x$-48-7*(
x$>="A")
15 DEF FN b():=16*FN a(a$(1))+F
N a(a$(2))
20 POKE 23658,8
30 INPUT "Start address "; LIN
E b$
40 LET a$=b$(1 TO 2): LET h=FN
b(): LET a$=b$(3 TO 4): LET l=F
N b()
50 POKE 23728,h: POKE 23729,l:
LET s=256*h+l: CLEAR s-1
55 LET z$="0123456789ABCDEF"
60 LET start=256*PEEK 23728+PE
EK 23729: LET add=start
70 GO SUB 2000
75 PRINT "f$;" ";
80 INPUT "Enter code "; LINE b
$
90 IF b$="" THEN GO TO 80
100 IF b$(1)="R" THEN LET add=
add-1: GO TO 70
105 IF b$(1)="S" THEN GO TO 50
110 IF LEN b$<2 THEN GO TO 80
120 LET a$=b$(1 TO 2): LET byte=
FN b()
130 POKE add,byte: LET add=add+
1
135 PRINT a$;" ";
140 IF LEN b$>2 THEN LET b$=b$
(3 TO ): GO TO 100
150 GO TO 70
500 INPUT "Do you want to save
"; LINE b$
510 IF b$="N" THEN STOP
520 INPUT "Name "; LINE b$
530 CLS: SAVE b$CODE start,add
-start
540 STOP
2000 REM change to hex
2010 LET h=INT (add/256): LET hh
=INT (h/16): LET f$=FN z$(hh)+FN
z$(h-hh*16)
2020 LET h=add-h*256: LET hh=INT
(h/16): LET f$=f$+FN z$(hh)+FN
z$(h-hh*16)
2030 RETURN

```

continued on page 122



continued from page 121

and letters in the column 'hexcode'. Type in a whole line at a time and the address and code will appear on the screen. If you make a mistake then typing in 'r' will enable you to retype the previous line. When you have typed the last line of hex then an 'S' will lead to a save routine to keep the hex on tape.

To minimise errors and make it easier to explain the program as a whole, it has been divided into its various sub-routines. Type those in one at a time; later they can be put together, using the **Collator** program in listing 3.

The first pair of routines, **TRON** and **TROFF**, are the ones which switch the interrupt vectors around. **TRON** loads the register I with 0FEH, that is, 254. That means that the vector holding the start address of our routine must be placed at address 0FEFFH, that is, 65279. The register I cannot be loaded directly and so we must first load the value into the A register. IM2 is selected for the reasons already stated and the remaining instructions DI and EI switch interrupts off and on. Strictly speaking they are not essential here but it might cause confusion for the machine if it was interrupted during this short routine at the wrong place.

**TRON** is really quite separate from the rest of the program. Its job is to set the machine up so that we can switch the trace function on or off at will. It must therefore be called early on by a **USR** call. More about that later when the whole program is in.

**TROFF** performs the opposite function in that it resets the machine to normal interrupts. You will notice that I is loaded with 3FH or 63. That is the address (3FFF) that the ROM sets up as an interrupt vector on power up. In interrupt mode 2 that would cause a jump to address 60 which is part way through the normal interrupt routine. It is important, therefore, when resetting to put the machine into IM1. The only **USR** call that is necessary anywhere in this program is the initial one to **TRON**. **TROFF** is called by means of a normal Basic variable.

Type in the machine code and save it. The start address is FE7E. The pair of routines can be saved together under the name 'tron'.

Once the whole program is in and enabled it is necessary to be able to switch the trace on and off. That can be done from Basic by inserting the line LET trace = x, where x can be one of three values: '1' will cause a call to **TROFF** thereby disabling trace; '0' will

## Listing 2.

Add	hexcode	label	Assembler	Comments
FE7E	F3	TRON	DI	switch off interrupts
FE7F	3EFE		LD A,0FEH	set up vector address
FE81	ED47		LD I,A	to FEFF
FE83	ED5E		IM 2	select mode 2
FE85	FB		EI	switch interrupts on
FE86	C9		RET	return to BASIC
FE87	FE	TROFF	DI	interrupts off
FE88	3E3F		LD A,3FH	restore the interrupt
FE8A	ED47		LD I,A	vector address to 3EFF
FE8C	ED56		IM 1	restore mode 1
FE8E	FB		EI	interrupts on
FE8F	C9		RET	return
		TRQ		
		ELINE	EQU 5C59H	
		VAR	EQU 5C4BH	
		ORG	0FE90H	
FE90	2A595C	TRQ	LD HL,(ELINE)	calculate the length
FE93	ED5B4B5C		LD DE,(VAR)	of variables area
FE97	A7		AND A	
FE98	ED52		SBC HL,DE	
FE9A	E5		PUSH HL	put length into BC
FE9B	C1		POP BC	
FE9C	EB		EX DE,HL	put variables start in
				to HL
FE9D	3EB4	SEARCH	LD A,0B4H	put code for "t" as first
				letter into A
FE9F	EDB1		CPIR	carry out search
FEA1	2806		JR Z,FOUND	
FEA3	78		LD A,B	end of variables?
FEA4	B1		OR C	
FEA5	2824		JR Z,ZERO	if so then there is
				no trace
FEA7	18F4		JR SEARCH	search on
FEA9	3E72	FOUND	LD A,72H	is next letter "r"?
FEAB	BE		CP (HL)	
FEAC	20EF		JR NZ,SEARCH	search on if not
FEAE	23		HL	is next byte "a"?
FEAF	3E61		LD A,61H	
FEB1	BE		CP (HL)	
FEB2	20E9		JR NZ,SEARCH	
FEB4	23		HL	is next byte "c"?
FEB5	3E63		LD A,63H	
FEB7	BE		CP (HL)	
FEB8	20E3		JR NZ,SEARCH	
FEBA	23		HL	is next byte last letter
FEBB	3EE5		LD A,E5H	and is it "e"?
FEBD	BE		CP (HL)	
FEBE	20DD		JR NZ,SEARCH	
FEC0	23		HL	jump over first byte
FEC1	23		INC HL	
FEC2	7E		LD A,(HL)	look at sign byte
FEC3	3C		INC A	jump forward if negative
FEC4	280A		JR Z,NEG	
FEC6	23		INC HL	is next byte 1?
FEC7	7E		LD A,(HL)	
FEC8	3D		DEC A	
FEC9	2802		JR Z,ONE	jump forward if it is
FECB	AF	ZERO	XOR A	trace must be 0 so load
FECC	C9		RET	A with 0 and return
FECD	3E01	ONE	LD A,1	load A with 1 and
FECF	C9		RET	return
FED0	3EFF	NEG	LD A,FF	load A with -1 and return
FED2	C9		RET	
		ORG	PRINT	
		PRINT	OFED3H	
FED3	E5		PUSH HL	save HL
FED4	211840		LD HL,4018H	screen address
FED7	5F		LD E,A	get print position
FED8	1600		LD D,0	into DE
FEDA	19		ADD HL,DE	
FEDB	EB		EX DE,HL	
FEDC	0600		LD B,0	
FEDE	21803D		LD HL,3D80H	character position for
				'0'
FEE1	79		LD A,C	get digit in to A
FEE2	87		ADD A	multiply by 8
FEE3	87		ADD A	



FEE4	87		ADD	A	
FEE5	4F		LD	C,A	and put into C
FEE6	00		NOP		
FEE7	09		ADD	HL,BC	calculate position in table
FEE8	0608		LD	B,8	there are 8 bytes
FEFA	7E	LOOP1	LD	A,(HL)	pick up bytes
FEFB	2F		CPL		invert byte
FEFC	12		LD	(DE),A	print it
FEED	14		INC	D	next pixel line 256 bytes further on
FEFE	23		INC	HL	next byte
FEFF	10F9		DJNZ	LOOP1	all 8 bytes
FEF1	E1		POP	HL	restore HL
FEF2	C9		RET		
<b>COUNT &amp; LINE</b>					
		ORG	OFEF3H		
		PPC	EQU	5C45H	
		PRINT	EQU	OFED3H	
FEF3	0E00	COUNT	LD	C,0	set counter to 0
FEF5	OC	LOOP2	INC	C	increase count each time through loop
FEF6	A7		AND	A	
FEF7	ED52		SBC	HL,DE	perform subtractions
FEF9	30FA		JR	NC,LOOP2	repeat till past 0
FEFB	0D		DEC	C	
FEFC	19		ADD	HL,DE	and difference back
FEFD	1802		JR	JUMP	jump over vector
FEFF	2D		DEFB	2DH	the vector (FF2D is MAIN)
FF00	FF		DEFB	OFFH	
FF01	C9	JUMP	RET		
FF02	2A455C	LINE	LD	HL,(PPC)	pick up line number
FF05	11E803		LD	DE,3E8H	a thousand
FF08	CDF3FE		CALL	COUNT	how many thousands
FF0B	3E01		LD	A,1	first digit
FF0D	CDD3FE		CALL	PRINT	print it
FF10	116400		LD	DE,64H	now hundreds
FF13	CDF3FE		CALL	COUNT	
FF16	3E02		LD	A,2	second digit
FF18	CDDEFE		CALL	PRINT	
FF1B	110A00		LD	DE,0AH	tens next
FF1E	CDF3FE		CALL	COUNT	
FF21	3E03		LD	A,3	third digit
FF23	CDD3FE		CALL	PRINT	
FF26	4D		LD	C,L	now the units
FF27	3E04		LD	A,4	fourth digit
FF29	CDD3FE		CALL	PRINT	
FF2C	C9		RET		
<b>MAIN</b>					
		ORG	0FF2D		
		PPCH	EQU	5C46H	
		TRQ	EQU	0FE90H	
		LINE	EQU	0FF02H	
		TROFF	EQU	0FE87H	
FF2D	FF	MAIN	RST	38H	carry out normal interrupt routine
FF2E	F5		PUSH	AF	save A & F
FF2F	3A465C		LD	A, (PPCH)	is a program running?
FF32	3C		INC	A	PPCH holds FF if not running a program
FF33	2002		JR	NZ,RUN	jump if it is
FF35	F1		POP	AF	restore flags and
FF36	C9		RET		return
FF37	C5	RUN	PUSH	BC	save all regs
FF38	D5		PUSH	DE	
FF39	E5		PUSH	HL	
FF3A	CD90FE		CALL	TRQ	check variable trace
FF3D	3D		DEC	A	if A not 1 then jump
FF3E	2005		JR	NZ,NOTON	forward
FF40	CD02FF		CALL	LINE	perform trace
FF43	1806		JR	RTN	jump to return
FF45	3C	NOTON	INC	A	is trace 0? If so then
FF46	2803		JR	Z,RTN	just return
FF48	CD87FE		CALL	TROFF	disable trace
FF4B	E1	RTN	POP	HL	restore regs
FF4C	D1		POP	DE	
FF4D	C1		POP	BC	
FF4E	F1		POP	AF	
FF4F	C9		RET		return to BASIC

switch trace off but leave it enabled. '1' will switch trace on. So if in your program you wish to trace through lines 300 to 700, say, insert in your program at line 299 LET trace = 1. Line 701 — LET trace = 0 — stops the trace. Then run the program.

The next routine **TRQ** searches the variables area to see if the variable trace exists. If it does not then it assumes a value of 0. If it does exist then the value is picked up. The method of finding the variable is to search through the variables area for the code 0B4H which is the code for 't' adjusted to show that it is the first letter of a long name variable (see page 167 of the manual, letter code 96 + 160). When the code is found each of the codes in turn is checked against the letters 'r', 'a' and 'c' finally against 0E5H which is the code for 'e' + 128, showing that it is the last letter of the name.

The value of a number is stored in five bytes. The first is 0, the second the sign byte holding 0 for a positive number and -1 for a negative. The routine first picks that byte and adds one to it. If the answer is 0 then the A register is loaded with FF (-1) and a return to the main control routine is effected. If it is not negative then the next byte is looked at. That is the least significant byte of the value, i.e.  $x - 256 * \text{INT}(x/256)$ . The byte is picked up and decreased by one. If the answer is 0 then it must have held 1 and so A is loaded with 1 and a return made. The only possible remaining value is 0 and so 0 is put into A and then the program returns to the main control.

There are, probably, easier methods of doing this, for example using the LOOK-VARS routine in ROM at address 28B2H, but it is important not to alter any of the system variables or the alternate register set because the processor is in the course of running a Basic program. Consequently no ROM routines at all have been used but only simulations of them.

Now type in TRQ and save it under that name. The start address is FE90.

The **Print** routine is the one that prints out the line number. Again there would be easier ways of doing it, using RST IOH for example, but again a simulation has been produced. The routine is entered with 'C' holding the value of the digit and 'A' its position — 1 for thousands, 2 for hundreds etc.

Every character printed on the screen consists of eight rows of eight pixels. Each row can be represented as one byte. As the screen is 32 bytes wide it

*continued on page 124*



## Spectrum Interrupts

*continued from page 123*

would seem that the easy way to print a character is to poke the first byte in and then the next byte 32 bytes further on and so on. The problem is that the screen is not laid out in memory in that simple and obvious way. In fact, each row of pixels is 256 bytes away from the last one. The algorithm therefore requires that each byte is poked into an address 256 bytes on from the previous. The pixel bytes are stored at an address pointed to by CHARS + 256 and the numbers start 128 bytes further on. As there are eight bytes for each character then the value in C must be multiplied by eight and then added to that base address.

The routine may now be typed in and saved using the name "print". The start address is FED3.

The next two routines are involved in sorting the current line number. **Count** divides the number in HL by the number in DE and returns the result in C and the remainder in HL. **Line** picks up the line number and uses Count to manipulate it digit by digit and then prints those out by calls to Print. The current line number is held in PPC so that is first picked up in HL. DE is loaded with 1000 and then Count is called to see how many thousands there

are. The number is printed using A to say the print position i.e. the thousands column. Then that is repeated for the hundreds and so on. Count overlaps the interrupt vector at FEFFH and there must be a jump just before it so that the processor does not interpret the vector as instructions.

The start address for this pair of routines is FEF3. They can be typed in and saved.

The final routine is the control routine called **MAIN** and it controls all the others and performs the necessary housekeeping tasks. The start address is FF2D; the one held in the interrupt vector FEFF. It is the routine called when an interrupt occurs.

The first task is a call to ROM address 56. That is the normal interrupt routine and it updates FRAMES, reads the keyboard and so on. Next the A register and the Flags register are saved so that normal service can be resumed on return. If a program is not running it will hold FF(-1) and then a return is made after restoring A and the flags register. If a program is running then the registers are saved and a call made to TRQ to see if the trace is to be switched on, off or disabled. TRQ return that information in the A register. Depending on the value in that register a call is

made to LINE or TROFF or none of those. Finally, all the registers are restored and control is returned to the ROM. All that remains is to collate all those routines. Type in the second Basic program in listing 3, rewind the tape and then run it, not forgetting to save MAIN first.

The third Basic program — listing 4 — will load the trace utility above RAMTOP. It, or something like it, must be used on switching on and before you load or type in the program under test. To enable the trace, i.e. to call TRON, you need to give the command RAND USR 65150 after any start or NEW.

Further sophistications can be added, such as a delay loop at the end of MAIN which will make it easier to follow the trace.

### Listing 3: Collator

```
10 CLEAR 65419
20 FOR n=0 TO 4: LOAD ""CODE :
NEXT n
30 CLS : PRINT "Prepare tape f
or saving Press ENTER"
40 PAUSE 4e4
50 SAVE "trace"CODE 65150,214
60 STOP
```

### Listing 4: Trace

```
10 CLEAR 65149
20 LOAD "trace"CODE
30 NEW
```

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A wealthy university has asked him, while he's cleaning this mess up, to capture an elusive stone-age cave rat.

What fun.

He just has to avoid the occasional poisonous frog.

Oh yes. And the wickedly clawed condors.

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Available on the Commodore 64.

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## FACES OF HAARNE

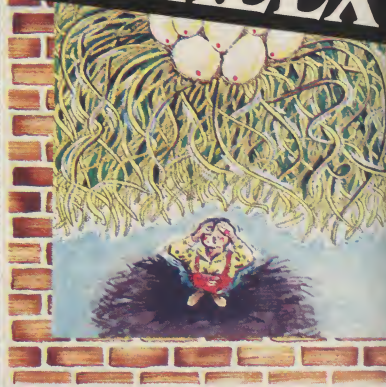


Night falls over the city and at the local museum Herbert the curator is doing his rounds. As he approaches the Green Room containing the mysterious and fabulously valuable "Faces of Haarne", strange noises can be heard from within. Armed with his steel-rimmed "Odd-Job" hat, Herbert enters the room. You won't believe what he encounters!

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are the Commander of a Space  
little ferrying cargo to Arcturus and all  
nets north. Whilst checking the  
entory, which includes Mega-Tennis  
is, Clockwork Oranges and Intoxo-  
verages, you hear some very peculiar  
ands coming from the hold. Dare you  
estigate?  
vailable on 48K Spectrum.



person the astronaut has crash-landed  
the planet Epsilon XI and the power  
cks that propel his rocket have been  
persed around the planet. Algies  
orts to re-assemble his power packs  
hindered by some rather eccentric  
forms; stinkers, mutant lawn  
wers, grandfather clocks?? What kind  
planet is this?  
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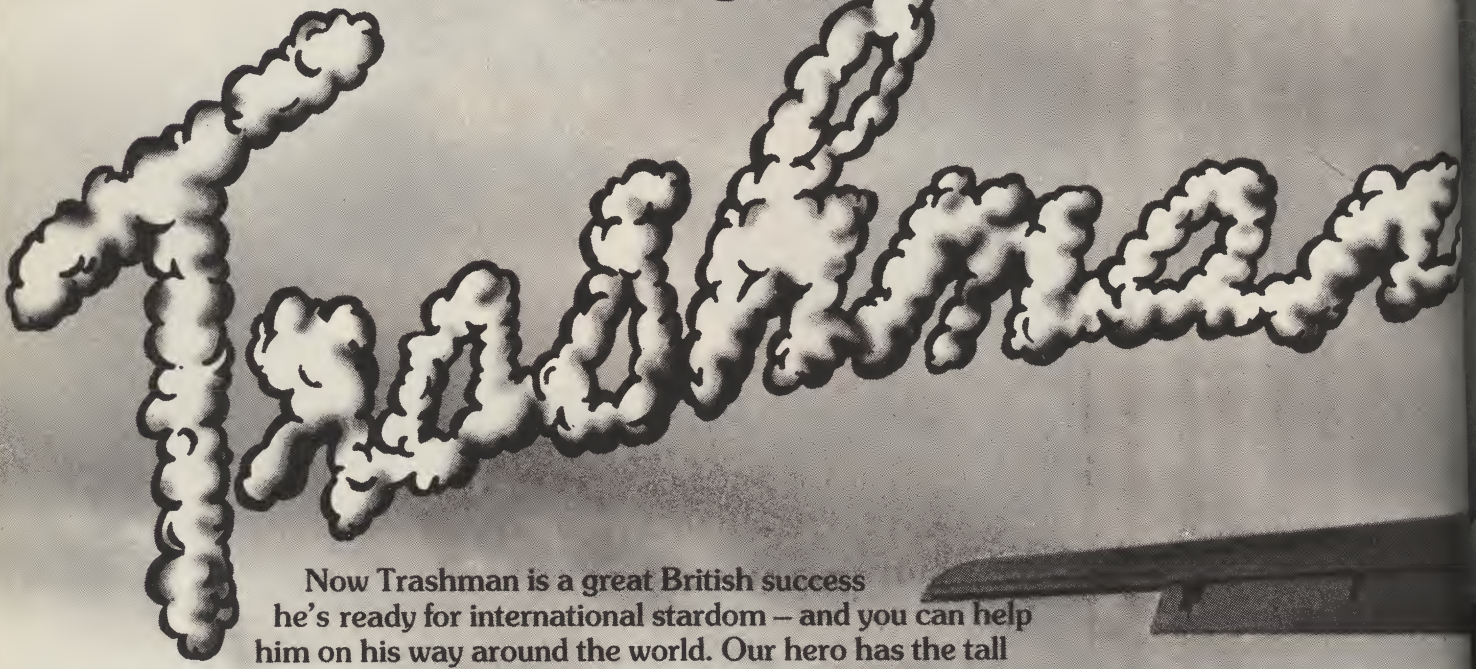
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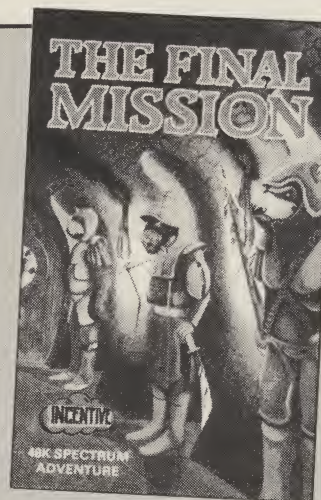
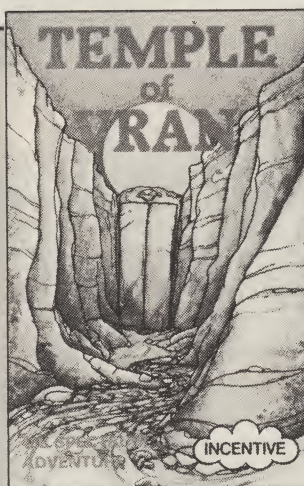
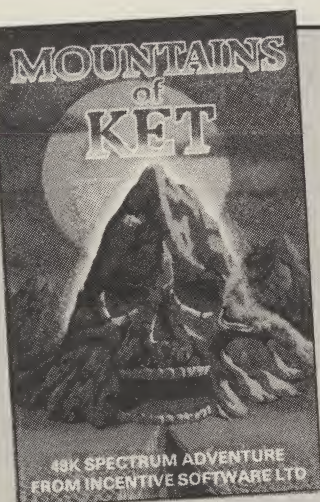
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# **GREAT KET COMPETITION**

CAN YOU decode the secret message and win the classic adventure game **Mountains of Ket**, together with its sequels, **Temple of Vran** and **The Final Mission**.

Examine the brief extract opposite from the diary of an unfortunate explorer who failed to defeat the evil Vran and his high priestess, Delphia. Hidden in the extract is a mathematical expression. Write the answer, which is a three figure number, on a postcard together with your name, address and telephone number. Post it to: Ket Trilogy Competition, *Sinclair User*, EMAP Publications, 67 Clerkenwell Road, London EC1R 5BH, to arrive not later than Friday November 16. The first 100 correct entries pulled from the bag after that date will win the presentation packs.

Employees of EMAP Publications and Incentive Software, their relatives and associates are ineligible. Only one entry per person is permitted and the judges' decision is final.



## ***The Ket Trilogy***

UNJUSTLY condemned for a murder you did not commit, you have been offered the chance of escaping the hangman's noose by undertaking a perilous quest. You must seek out and destroy the evil Delphia and Vran Verusbel, priestess and leader of the cult of the mad monks.

The quest spans three adventures, **Mountains of Ket**, **Temple of Vran**, and now, completing the long haul, **The Final Mission**. In the first you must travel to the Mountains of Ket, and then underground, fighting monsters as you go. Once through the mountains, the second part begins, in which you must seek

the temple of the cult of the mad monks and destroy it.

The Final Mission, only recently released, brings you to the ultimate showdown with Vran himself, penetrating his inner sanctum beyond the Guardians of the Gate. All three adventures will be available in the shops in a presentation gift pack costing £12.95, but you have the chance to win them for free in this *Sinclair User* competition.

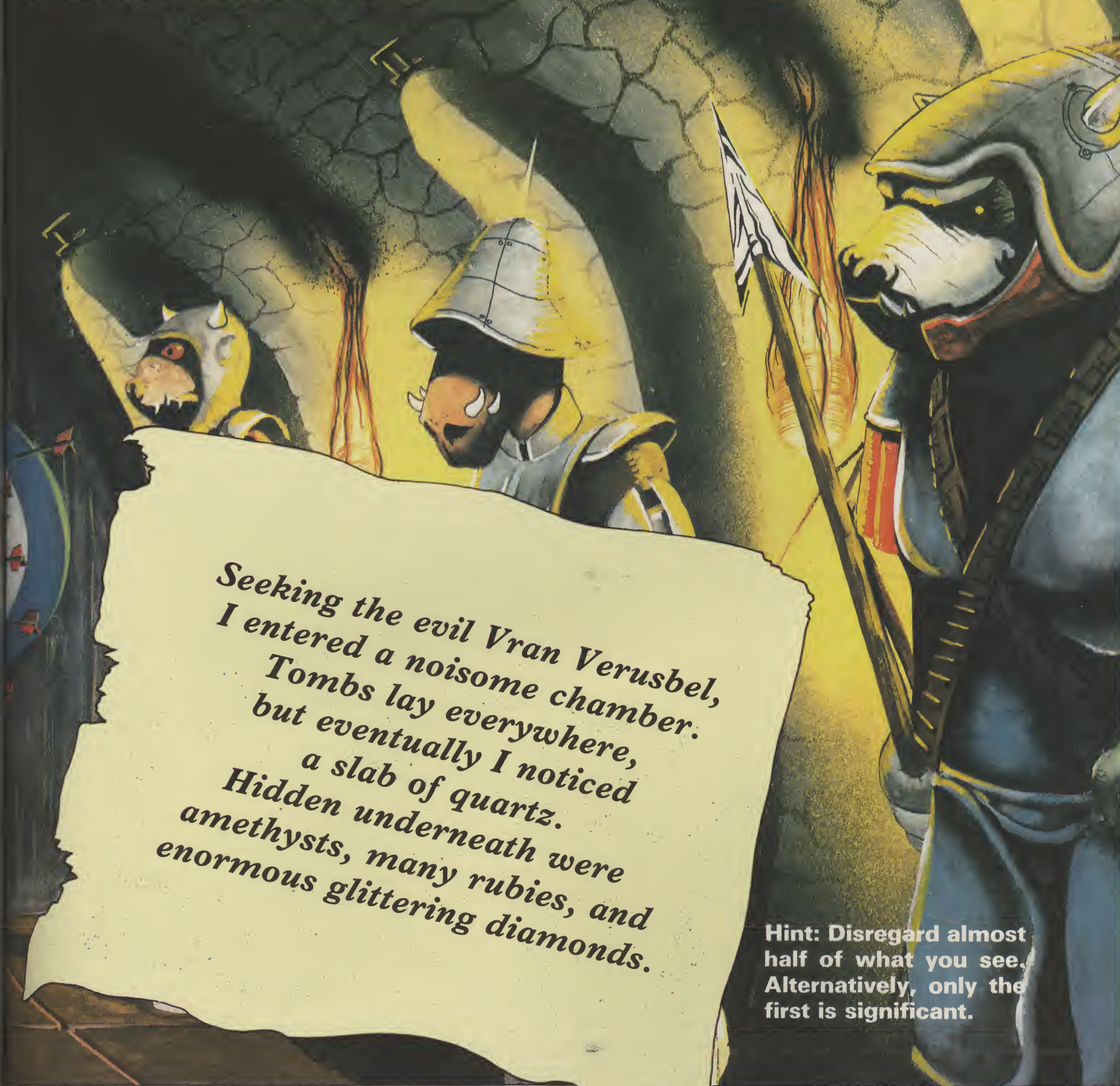
There is a rather more substantial prize awaiting the lucky adventurer who manages to complete the whole of the trilogy. Incentive Software is offering £400 worth of video equip-

ment to the first player to decipher the hidden message, one part of which is revealed at the end of each program.

The Ket Trilogy has been acclaimed by the critics not only for its complexity and playability, but also for the finely designed world of Ket and the unique combat system, which gives a blow-by-blow description of the fighting in a style similar to that of fantasy role-playing games such as *Dungeons and Dragons*. Each game is more difficult than the previous, so inexperienced adventurers can develop their skills as the quest progresses.



# THE FINAL MISSION



*Seeking the evil Vran Verusbel,  
I entered a noisome chamber.  
Tombs lay everywhere,  
but eventually I noticed  
a slab of quartz.  
Hidden underneath were  
amethysts, many rubies, and  
enormous glittering diamonds.*

**Hint:** Disregard almost half of what you see. Alternatively, only the first is significant.



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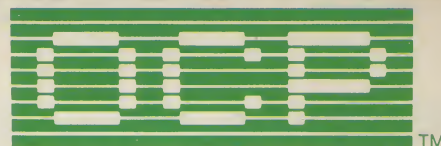
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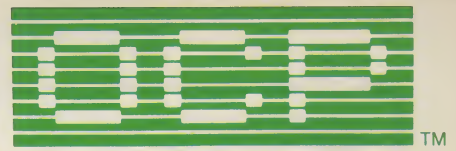


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**ADDRESS MANAGER** and **FINANCE MANAGER** utilise the same "on the page" presentation and offer 48K Spectrum owners a professional standard address filing, indexing retrieval, and financial analysis system. Below are examples of the screen presentations.

Both have been carefully constructed to provide the user with a tool that is extremely friendly and easy to use, the speed and presentation of these programs are second to none.

```

MENU
1 LOCATE ENTRY
2 ADD ENTRY
3 AMEND ENTRY
4 DELETE ENTRY
5 SELECT ENTRIES
6 DISPLAY ENTRIES
7 PRINT ENTRIES
8 MAINTAIN FILE
Position Cursor — then press ENTER
    
```

```

ADD ENTRY
SURNAME JOHNSTONE
FORENAME EDWARD SIMON
ADDRESS 17 ALSWELL CRESCENT
WIDEFORD
GREAT YARMOUTH
NORFOLK
POSTCODE NVT 8RH
PHONE NO 0789 6754
INDEX DEC GLF GC
    
```

```

SELECT ENTRIES
INDEX GLF GC DEC
PRINT SELECTED ENTRIES
PRINT FORMAT
FULL LIST or EDITED IF L E
(press BREAK to cancel PRINT)
SELECT (ANY matching)
SELECT (ALL matching)
RETURN TO MENU
    
```

```

PRINT ENTRIES
FIRST NAME
LAST NAME
PRINT FORMAT
FULL LIST or EDITED IF L E
(press BREAK to cancel PRINT)
PRINT
RETURN TO MENU
    
```

**ADDRESS MANAGER** features MULTIPLE INDEXING via our 3 way 3 character index, an ability to store over 400 full names and addresses or 1500 individual names/titles.

USES include storing and updating names, addresses and phone numbers, printing out Xmas card lists, etc, mail order work, customer classification by type size (doctors have used this program to catalogue patients by treatment).

**FINANCE MANAGER** is a powerful, flexible and fast MENU DRIVEN general purpose program carefully designed to handle up to 255 separate accounts for domestic and business accounting applications. The magic of MACHINE CODE has enabled us to produce the very latest "on the page" presentation which lets you enter and edit data naturally, as if with a pencil and paper.

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```

LIST BALANCES
10 10 83 SAINSBURY 118 65
10 10 83 food 28 48
10 10 83 ACME 64 55
10 10 83 TESCO 115 00
10 10 83 EXPRESS DAIRY 19 98
10 10 83 food
BACKWARD FORWARD EXIT
    
```

```

ANALYSE EXPD
23 04 83 LUT PMS 12 00
10 10 83 chemists 18 88
10 10 83 clothes 65 00
28 10 83 club 15 00
10 10 83 drink 29 42
10 04 84 electricity 240 00
10 10 83 food 201 70
10 04 84 gas 808 00
10 04 84 phone ins 69 00
14 04 84 housepaint 1000 00
BACKWARD FORWARD EXIT
    
```

```

LIST BALANCES
10 10 83 ACCESS 2 00
10 10 83 ACME 28 42
10 10 83 BERT 3 50
10 10 83 BOOTS 18 88
10 10 83 C.A.A. 26 90
10 10 83 CASH 89 19
10 10 83 EXPRESS DAIRY 19 98
10 10 83 GARRAGE 15 50
10 10 83 LUGIS 32 00
10 10 83 M & S 18 00
BACKWARD FORWARD EXIT
    
```

```

ADD SO
AMOUNT 750
ACCOUNT EMPLOYER
WHO TO FROM NATWEST
DESCRIPTION wages
DUMMY (D) DATE
14 ADD EXIT
    
```

But that's not all, not by a long way. This program automatically raises a corresponding debit or credit for every entry, and will even open up a new account if an entry features an unrecorded account name.

Accounts can be MERGED, DELETED, ANALYSED, MARKED as priority, RENAMED, EDITED and SCROLLED. Transactions can be RECONCILED, AMENDED, DELETED, PRINTED, DESCRIBED for analysis and RENAMED. Standing orders can be APPLIED, REMOVED, DESCRIBED, AMENDED, DELETED and even DUMMIED for planning purposes. Other features include DATE CHANGE, RUNNING TOTALS, 2 KEYBOARD MODES, PRINT PAGE/ LINE/BLOCK/FROM END/FROM START/FROM DATE etc., LIST BALANCES, FIELD ERASE/INSERT/DELETE, EXIT TO BASIC. You may not want all these features but they are there just in case.



## UTILITIES

£9.95



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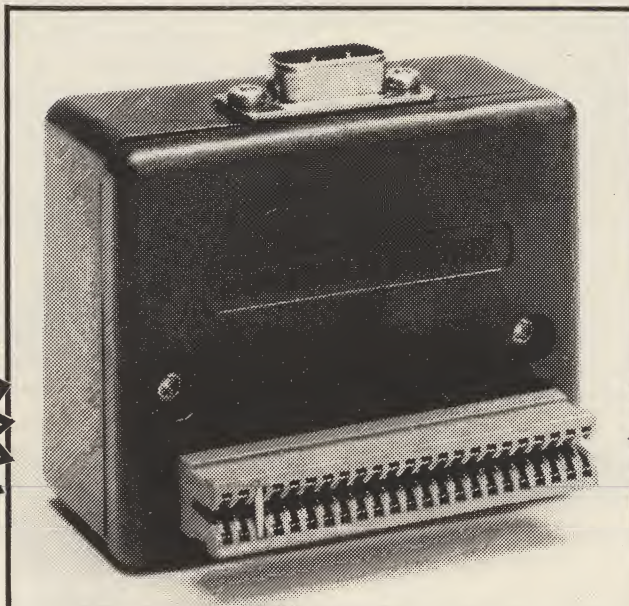
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er 1984



# Flying low

Chris Bourne talks to Costa Panayi, laid back pilot of TLL



**I**N contrast to the concept of whirling motion suggested by its name, Vortex Software is as laid-back an outfit as you are likely to find in the frenetic software industry.

The company is very much a family business. Brothers Costa and Crete Panayi handle programming and advertising respectively while brother-in-law Luke Andrews concentrates on administration and finance. Greek Cypriots by ancestry, the strong emphasis placed in Greek culture on family ties and loyalty serves the brothers well in their business enterprise.

The founder of the company was Costa, the programmer. As often happens in the industry, the other brothers were brought in later as the operation grew more professional and required their particular talents.

Costa's first introduction to programming was at the University of Salford, where he took a Fortran course as part of his degree in Mechanical Engineering. At first Costa was more interested in the machinery than the programming of computers, and wanted to buy a kit. "I fancied a UK101, but I couldn't afford it. Then the ZX-81 appeared, and as soon as I saw the ad I ordered it. I had to wait three months before it arrived."

By now Costa was working as a design engineer for British Aerospace, and a number of his colleagues at work were also excited by the new machine. "We had bets on which one would arrive first. Mine was last. There were about half a dozen of us, and we swapped programs at work."

It was on the ZX-81 that Costa learned Basic, and the first few programs he wrote were in collaboration with his friend at work, Paul Canter. They sent off their first tape to Michael Orwin, of Orwin Software. "It was a collection of programs, Mastermind, Pontoon, Othello and Awari. We were quite chuffed. You wouldn't believe it, he's still sending us money."

At the time, however, Costa had no intention of quitting design engineering, his chosen career. Besides, he was still learning how to program, teaching himself machine code from books.

"The 1K machine was really useful for learning how to be efficient. To begin with it was difficult to see how you could write games."

Costa began by writing routines instead, mainly connected with screen displays. The scrolling techniques he developed were later used in **Cosmos**, now known as **Astral Convoy**. He and Canter set up Vortex Software and decided to sell it themselves.

The timing was atrocious. Suddenly

the Spectrum appeared on the scene and sales of **Cosmos** went flat as pitta bread. They quickly converted the game to the 16K Spectrum, including sound and colour features, and, deterred by their initial experience, licensed the game to another company.

Costa then began work on **Android One**, and it was at that time that his brother-in-law Luke became involved. "It was a natural progression for Vortex," Luke explains, who is a craft teacher.

"I'd handled money work- ing as a teacher and I used to have my

own furniture-making company." Crete

Panayi had already helped

Costa with the advertising side,

drawing on his ex-

perience working for an

advertising agency and his

knowledge of design.

Costa's games can easily be seen as a progression of ideas,

developing concepts from game to

game. The original scrolling technique

developed on the ZX-81 in 1K have

formed a major feature of all Vortex

games, along with other ideas such as

3D effects and large playing areas.

Although the original routines are no

longer recognisable in the latest pro-

ducts, the development of the style has

been a continuous process.

"For **Android One** we tried to pro-

duce a game with a lot of features. We

used the scrolling techniques to pro-

duce a long corridor, and designed a few

rooms, then tried to get something run-

ning about the screen." It seems a slap-

happy technique to design a game while

writing it, putting together chunks of

old routine and working out the possi-

bilities, but that is one view of the

process by which Costa writes games.

"We try to look at the trends" he says.

The idea for **TLL** came simply from the

popularity of **Flight Stimulation**, al-

though the game bears no resemblance

whatsoever to the Psion program.

**Android One** became a popular suc-

cess, and was accepted for retail by W H

Smith. The sequel, **Android Two**,

takes the action further using a consid-

erably expanded playing area. The ob-

ject of the game is to move around a

maze-like park destroying blue milli-

poids.

"I wanted to do a sequel which had

something special about it. That's why



I developed the 3D effect. It was our first 48K game, and took me 9 months to write. It was released just before Christmas 1983."

Nine months is an enormous length of time to produce an arcade game, but it must be remembered that all the time Costa was still working for British Aerospace. The game itself caused problems, as the ideas Costa was putting into practice were highly ambitious.

"The game became so complex" he says. "The millipoids caused problems. Most people use dark backgrounds but we decided to use the BRIGHT colours. The other thing was the wraparound maze."

The long haul was certainly worth it. Lurid is the only word to describe those background colours—there is an almost tangible feeling of poisonous heat about the game.

"I was tempted to do **Android Three**," says Costa laconically, threatening further horrors in his metal world of mayhem. "But I decided to leave it for another day."

"TLL is really a progression of the ideas in **Android Two**. I expanded on the 3D landscape, making the wrap-around more complex. There is an extra dimension as the plane isn't always on the ground."

TLL was one of the big hits of the summer, with superb graphics of buildings. "It's easier to get into TLL than **Android Two**" suggests Luke Andrews. "My best score is 34,125. We always like to make each game something of an adventure. There is a sort of Vortex cult. For instance, we don't tell you everything about TLL on the cassette insert."

An example of that is the fact that you can fly under bridges and telephone lines in TLL, which at first simply look like obstacles to be avoided. The first time you go under the bridge the 3D aspect of the game really opens up and you see the plane duck under and out of the other side. Costa himself is particularly proud of the shadow which the plane casts. When you fly over a building the shadow climbs up the wall, which, if you think about it, means suddenly it has to move faster than the plane to keep up. "It took a bit of doing that," says Costa, smiling quietly.

The brothers are a quiet spoken trio and Luke is very sanguine about the problems suffered by the software

industry of which we read so much in the computer press.

"Garages are going bust all the time" says Luke. "People don't mention that. Software houses have matured a great deal, but we still regard ourselves as beginning. If we haven't got the money for something then we don't do it. We haven't drawn a penny out of the account yet for ourselves."

That situation is likely to change in



the near future as the company plans to move into a real office—at present it still operates from the front room of Luke's house in a leafy Manchester suburb. Costa left British Aerospace earlier in the summer to devote himself full-time to programming, and thus will require a living from the business.

Vortex has appeared to be happily isolated from some of the problems faced by other companies, partly because of its policy of never borrowing money, and partly because it has released so few titles and yet managed to sustain a loyal following. "We can't be doing too badly" says Luke. "People tell us we're in a slump. Yet in this depressed period TLL has consistently been in the top five since its release. Too many people say it's a seasonal thing, but people still want software in the summer."

If Vortex as a business takes few risks and aims for consistency of quality rather than a high profile and a galaxy of quick-money instant games, Costa himself takes risks of a different kind. "A guy at work in his early sixties did a parachute jump and then put up a notice daring everybody else to copy Granddad," he explains.

Costa and a group of friends went to Langer Airfield in Nottinghamshire, home of the British Parachute School, to try their hand. "The first jump was

over a weekend, you get a day's training and then you do your jump on the Sunday. Once that's done you try to get as many as you can in order to be able to go freefall."

"I've never seen him so enthusiastic about anything before" says Luke. "It's a fantastic sensation" says Costa, and goes into reveries about the joy of jumping out of aeroplanes. Wasn't it just a bit scary? "The night before the first jump was worse" says Costa. "But once you've got your kit on you don't think about it."

Costa is unlikely to be getting much time for parachuting over the next few weeks, as he is busy working on the new game, **Cyclone**. The promised move to a new office will therefore be delayed until the game is completed, so it is likely to be one of the last programs Costa writes by himself, as the new plans include creating a design team to work around him, producing two or three games a year for a range of machines. That may seem a small quantity, but it is more than Vortex has been producing over the past three years.

The way the games are created, with nobody at all sure what Costa's final version is going to involve until it happens, means that the team is understandably reticent about describing **Cyclone**. Luke explains that even the advertising causes problems, as they genuinely do not know what the game will include when the advertisements have to be placed. Hence the mysterious shadowy Tornado in the TLL ads, about the only thing that was certain about the game at the time.


**Cyclone** however will be another flying game, but with a much bigger playing area than TLL.

"Watch out for innovations" says Luke, mysteriously. "I can guarantee that. And the weather will play a central part."

Jim Bacon meets the space pirates? Michael Fish versus Pacman? At any rate, the game is due to be released at the end of October, and Vortex is certainly looking for a Christmas hit with **Cyclone**.

It seems that while the gales blow around them, and other businesses rock and even crumble under the force of 'natural market pressures', Vortex stays cool—the calm spot at the centre of the whirlwind.





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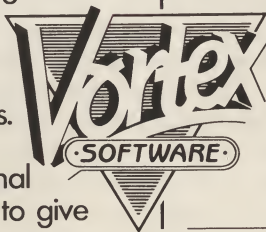
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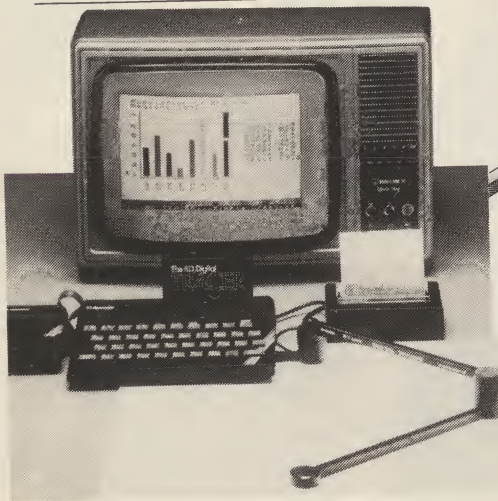


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# Raiders of an ancient art

**In the first of a regular series Richard Price examines the history of role-playing and the development of micro adventure games**

IT IS NEAR DAWN with only the hum of the transformer and the glare of the TV screen to keep you company. Dog-tired, bleary-eyed and suffering from severe back and brain strain you desperately try to escape a band of roving cannibal orcs amongst the dungeons of a menacing fortress. Your computer is overheating and it seems like a week since you last slept but you cannot give up now. You want to be a hero and the real world can just wait until you have managed it.

Recognise yourself? If you do, then you know you are an adventure addict, hopelessly hooked on the multiplicity of fantasy worlds that the computer can offer for exploration. That jumble of wiring and chips can transport you into the far future aboard a giant spaceship or to medieval worlds where magic and myth rule.

To survive in those places you will need a crossword puzzler's mind and be able to solve complex logical problems by a mixture of luck, cunning, planning and lateral thinking. Computerised brute force will come in handy too when your luck dribbles away and you are face to face with some fire-belching dragon.

It is easy to think that computer technology has made all that possible but there is more to it than just the machine. Mazes, and the symbolic hazardous journey through them, have had a powerful fascination for the human mind for many thousands of years.

At Tintagel in Cornwall, bronze age tribesmen hammered intricate labyrinth patterns into the rocks, perhaps as some mystical depiction of the soul's wanderings from birth to death and back again. Before them the first farmers decorated the huge stones of their communal tombs with swirls of interlocking lines and spirals. Dancing mazes cut into the turf still survive in a few places around the country and, all over the world, there are myths and legends of heroes and heroines overcoming the terrors of

the labyrinth or other subterranean places to emerge powerful, fulfilled and triumphant.

Almost all those stories portray a human character facing intolerable danger in threatening places, often lost, often afraid, but succeeding through his or her wit and persistence. Maybe the ordinary, small person has always needed such fantasies as a welcome escape from the humdrum reality of everyday life. With the machine's help it is now possible to enter the unknown and make your own decisions about how the story should develop. No longer a passive listener or spectator, you can become Theseus, Bilbo Baggins or Sherlock Holmes for a day and still get back in time for your beans on toast.

Most people would accept that JRR Tolkien is the father of modern fantasy writing and his plots and terminology run through many of the games that use magical or heroic worlds as their setting. His themes, combined with war-gaming rules, were adapted by Gary Gygax and Dave Arneson as the basis of their role-playing game *Dungeons and Dragons*. In that system a Dungeonmaster designs a complex of caves peopled by monsters, treasure and magicians. Through that place, a party of adventurers will journey. Each of them must take on a character and act out their role in as 'real' a way as possible. The more consistent and inventive the setting, the more pleasure, excitement and satisfaction for the player.

There are now many variants on the original concept, from outer space to Middle Earth, but they all expect the player to do more than just chop up monsters and often demand problem-solving skills and ingenuity. Role-playing games have a vast and dedicated following and their devotees can sometimes seem like members of an esoteric religious cult. Psychologists would claim that the game helps young people to work out their personal problems through safe fantasy.

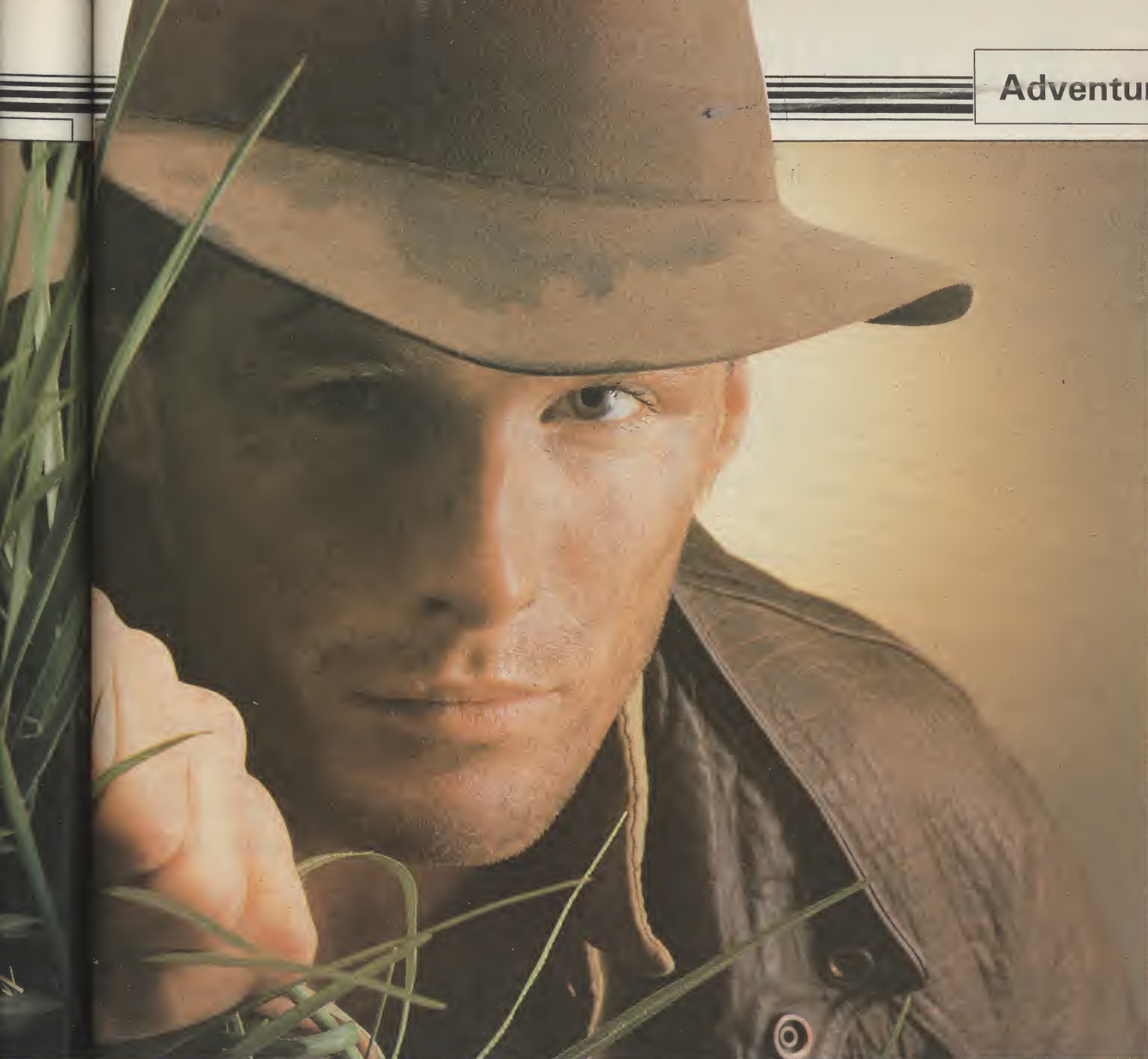


Absorbing as RPGs are they suffer from a major disadvantage. Creating a dungeon is a painstaking business and the play itself needs the concentrated attention of up to five players all of whom must be willing and able to give up several days, or longer, to their hobby.

That means that a lot of organisation is needed to make a session work well even if you can drum up the group of adventurers. The action itself can also be slow as there are numerous die rolls and consultations with rule books to interrupt the flow of play.

Two computer programmers, Crowther and Woods, translated that sort of single role-playing into computer language and plumbed it into their mainframe. Computer text adventure began with them in the not so remote past of the early seventies. Their original *Adventure* featured a Tolkienesque plot set in a twisting labyrinth with





lots of tricky puzzles and mean monsters. Once Sinclair had pioneered the home computer the field was open for rapid development of the art.

Computer text adventure comes in all shapes, sizes and eras but there are fairly standard features which define the genre. The interpreter must be able to understand some basic English, often just a verb/noun combination and also carry a set of built-in commands and requests, such as Help, Inventory or Score.

Good programs will always possess a varied concealed vocabulary for the player to discover by trial and error. Getting the right words for the right action is one of the trickiest problems in adventure, especially where magic is involved.

Informative location descriptions and a versatile response from the interpreter are very important as they help to set the scene and make the player feel that

the computer has a personality, just like the old Dungeonmaster. Most players would also expect the locations to be properly connected so that a map can be made.

Above all else the theme and the setting ought to be internally consistent. If you are exploring a world where magic is possible then that magic should follow its own rules and not be the excuse for a failure of the writer's imagination. It is also off-putting to wander through some heroic medieval landscape and discover an inn with pool tables or similar oddities. Too many unsuccessful programs hurl a jumble of different eras and technologies together.

The arrival of the Spectrum, with its large memory and graphics capability has inevitably meant that adventure programming has become more and more sophisticated and there are many variations on the format currently available. The purists probably will still

argue that text-only adventures are the real thing as they don't waste valuable space on pretty pictures and are often good value for money, tending to have more locations and better descriptions.

Level 9 produces a range of text games that are inventive, involved and usually large. If you're keen to try out a version of the original mainframe Adventure its **Colossal Adventure** has a lot of similarities but has more locations and a slightly altered set of problems. Other games by the same company carry on from where that game stops.

Level 9 takes a lot of trouble over the plots and settings of its programs and, if you are after an adventure with a difference take a look at **Snowball**. You will find yourself in a vast interstellar spaceship that has gone out of control. While swarms of colonists hibernate in blissful ignorance of the danger you must explore the ship and find the main con-

*continued on page 150*



# L You really can't go wrong with any Level 9 game as they are really brilliant

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✓ But it's not just the size of the game it's the quality as well that is astonishing ... scenes to fire the imagination.  
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✓ As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denizens.  
**Which Micro?, February 84**

✓ (LORDS OF TIME). As we have come to expect from Level 9, the program is executed with wonderful style.  
Highly recommended.  
**PCW, 1 February 84**

✓ I thoroughly recommend these Adventures, they are excellent value for money. No self-respecting Adventure-addict should be without them. I believe Level 9 are producing a series of Adventures which should be regarded as classics.  
**Atari User, July 84**

✓ These programs run very fast and there are no frustrating pauses. Level 9 Adventures are superbly designed and programmed, the contents first rate. The implementation of Colossal Adventure is nothing short of brilliance; rush out and buy it. While you're at it, buy their others too. Simply smashing!  
**Your 64, June 84**

✓ Level 9 - arguably the producer of the best adventure games in the UK - has done it again. LORDS OF TIME is a sparkling addition to its stable of winners.  
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continued from page 147

trols. Guard robots menace you and the sheer vastness of the vessel means that your task will be long and involved. The technology is very carefully constructed and the design is extremely convincing with over 7000 locations.

If you would rather be a classic, albeit reluctant, hero, the **Ket Trilogy** from Incentive Software provides all the magic and mayhem you will need. **Mountains of Ket** and **Temple of Vran** feature mad sorcerers, battle-crazed orcs and combat routines which help to bridge the games nearer to their D&D ancestors. It is also satisfying that the story continues from one program to the next. The world of Ket is consistent and exciting and is well worth a visit.

Adventures using graphics, either to illustrate locations or to show the action itself, seem to be becoming the norm. Games, however, like **Atic Atac** or **Halls of the Things** are not in that class. Those so-called graphic adventures are little more than glorified arcade games and do not have the features that define proper adventures, exciting and accomplished though they are.

It would be difficult to discuss text adventure without mentioning **The Hobbit** from Melbourne House. That program has set a standard for future

adventures with its use of nearly English 'English' and interactive characters who live their own lives while you are busy trying to get out of the goblin's dungeon. A vast range of input is allowed and the variations of possible actions make it seem like ten games rolled into one, though some may find the routine of talking to characters rather tedious at times.

After **The Hobbit** programmers looked for more and more innovation. **Valhalla** combined animated cartoon-style graphics with a versatile text interpreter and has shown the huge potential of the Spectrum. Despite some flaws — like the occasional crash — the game is open to a number of uses. You can follow the quests if you like or develop your character independently, choosing to be evil or good as the mood takes you. The other inhabitants will respond convincingly to the role you take on and they too will go about their own lives, which of course you can sit back and watch if you do not feel like joining in.

**Lords of Midnight** from Beyond does not quite fit the adventure description. That immense game with its 3D static graphics, multiple leading characters and strategic planning uses an adventure plot mixed in with wargaming concepts. Armies and allies have to be

recruited to defend the world against Doomdark, a Sauron-like sorcerer. The four major characters are guided through the meticulously detailed landscape by the player and there are various ways of defeating the powers of evil. The program is very reminiscent of *The Lord of the Rings* in its theme and you can make the story what you will.

The best adventures are those where a true multiple choice is involved. It is easy to spot a poor program by the linear nature of the action — only one entry is correct and you cannot proceed unless you do exactly what the programmer has put in. In most of the games mentioned there is a reasonable freedom of choice. Remember though — freedom of choice may mean you will find yourself up the creek later on. A bit like real life, in that respect, and that for many is the entertainment in adventure. You will learn from your mistakes, load your saved position and wearily start all over again, but still get a lot of fun and excitement in the process.

*The mysteries of adventures can baffle even the greatest hero or mage at times. If you are having trouble on your travels or have hints and tips to offer fellow explorers we would like to hear from you. Scribe your letter to Richard Price c/o Sinclair User, EMAP Business and Computer Publications, 67 Clerkenwell Road, London EC1R 5BH.*

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# Mindstorming

Theo Wood talks turtle at the Logo Conference and listens to blunt-speaking guru Seymour Papert

**L**OGO USERS are a special breed of enthusiasts; not only are they deeply involved with the computer language Logo, but they attend a weekend conference discussing it. The British Logo Users Group held its annual conference at Loughborough University at the beginning of September. Conferences are rather like exhibitions where everyone who shares a like interest can see both hardware and software and catch up with all the latest developments. Conferences are also the venue in which much discussion can take place as to the relative merits of the goods on offer, and an opportunity to hear experts expound their views in greater detail.

There are some exciting developments afoot in the hardware field. On show was the radio controlled Jessop turtle, developed at the Artificial Intelligence Department at the University of Edinburgh. The Para version has an interface which will operate on specific computers; that means a version is available for the Spectrum.

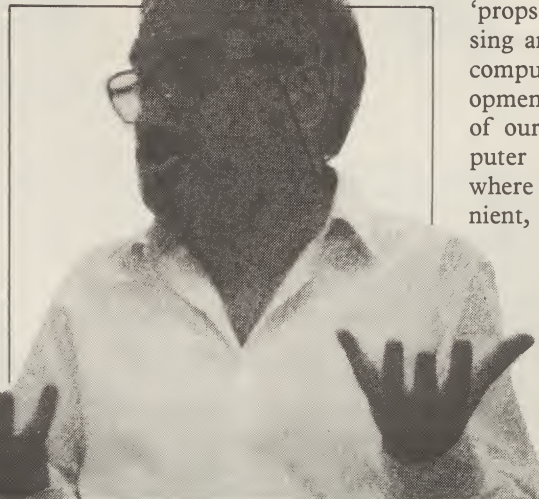
The radio control module will fit into the user port enabling the turtle to be controlled through Spectrum Logo. There is no problem with cables getting in a twist as the turtle moves around, and that is an obvious advantage. The Jessop turtle, looking like a transparent dome full of chips, was dressed in a motley array of outfits to make it look like a turtle, with head, legs and arms sticking out, reminiscent of Auntie Dot's yearly offering for the school jumble sale.

The Valiant Turtle accomplishes the feat of remote control by infrared and has a plastic body and eyes which glow. That will also interface with the Spectrum and be controlled by Logo. Prices of both these products are, however, almost certainly beyond the pocket of home users as neither would leave any change out of £200.

Of more interest to the home user is Zero 2, a clever little robotic device which will plug into Spectrums fitted with an RS232C interface. That will operate directly with Spectrum Logo. The basic model has three stepper mo-

tors, two leds, a two tone horn and a line follower. It includes a pen kit for drawing via Logo commands either on the floor or table. A kit form can be bought for as little as £79.95 or built for £99.95. With an eye presumably on the Christmas market, there is a strong possibility of a package bundling Zero 2 with Sinclair Logo for about £120. One has to hope that the device will live up to its specification especially in terms of resolution, supposedly better than 1mm and 1 degree.

User defined graphics are fun to play with, as defining your own shape can lead



Evangelist Seymour Papert.

to great possibilities when writing games programs. Nevertheless they can be rather tedious and time consuming, with the added disadvantage that the BIN statements have to be typed in very carefully. There then follows the problem of making them move. The results are not always fast enough in Basic and require machine code routines to make them work at the desired speed.

The Spectrum sprite board is the answer to all those dreams of fast on-screen action without the sweat. Fitting into the user port of the Spectrum the sprite board provides 32 independently programmable sprites which can move in any direction all at the same time. The sprites will be programmable either from Basic or Logo. By using the second option in particular, animation is within the reach of far more people than before.

Marketed by Logotron, the Spectrum sprite board will be available at a price of £129.95, but as with all new technology one would expect the price to fall as production gets into gear.

Sprites were one of the main topics covered by Seymour Papert in his presidential address to the conference. Papert is the guru of the Logo movement, because not only did he and his team develop the language, but his book *Mindstorms* is the Bible of Logo enthusiasts. He is also a very witty and amusing speaker.

Prefacing the main section of his speech with demonstrations of his 'props', a camera with automatic focusing and his impressive NEC portable computer, he explained how new developments in technology enter the fabric of our lives. Thus the portable computer enables him to write in places where pen and paper are most inconvenient, such as in taxis, but it also becomes 'his' in a way no desktop computer could.

Papert is a somewhat blunt speaker; anyone who makes statements such as "Newton's Laws of Motion are horrible" must strike a chord with all those who have to study them in their school career. Motion is everywhere in our lives yet the laws which cover it are not immediately accessible and are expressed with reference to a particle, an abstraction. With sprites it is possible to explore the world of movement, just as Logo and the microworld of turtle graphics enable users to explore geometry in a concrete way.

As an evangelist Papert is bound to have his critics, and some delegates could be heard muttering sceptical comments about his claims for Logo. Yuri Leon, from the Haifa Institute of Technology, pleaded for moderation in the claims made for Logo, otherwise the situation may backfire, and many people would be disappointed.

**Jessop Electronics Ltd**, Unit 5, 7, Long Street, London E2 8HN. Turtle Price £170 + VAT.

**Valiant Designs Ltd**, Park House, 140 Battersea Park Road, London SW11 4NB. Turtle price £199 + VAT.

**Zero 2**, Highbury Workshops, 22 Highbury Grove, London N5 2EE.



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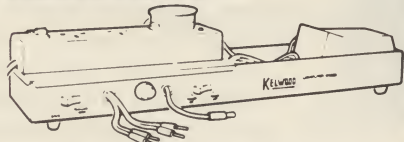


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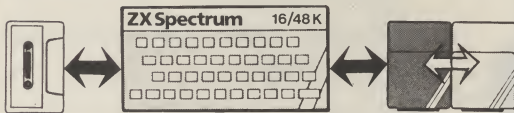
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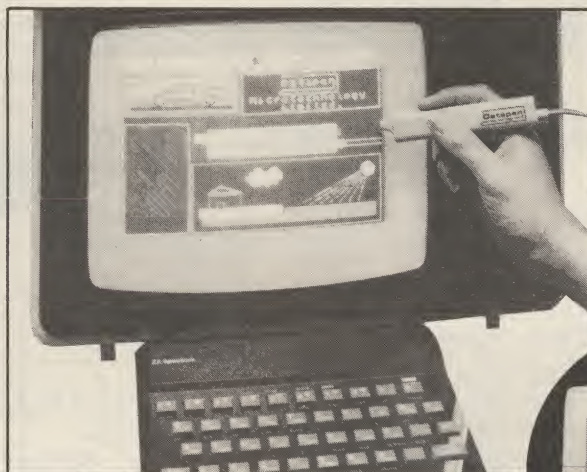


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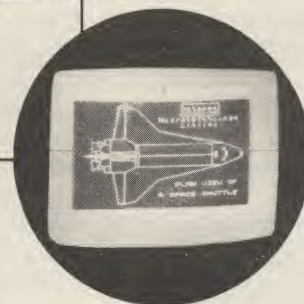
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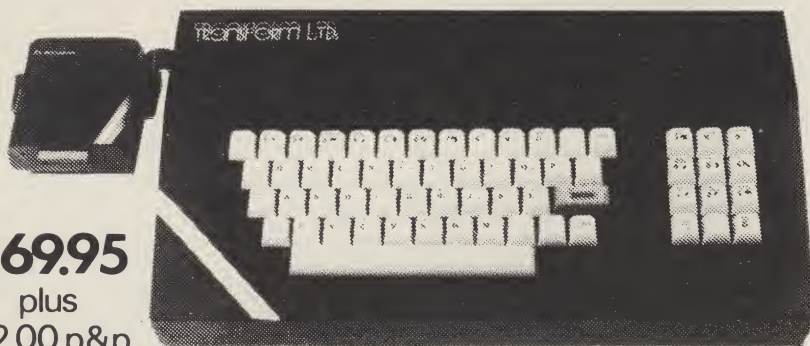
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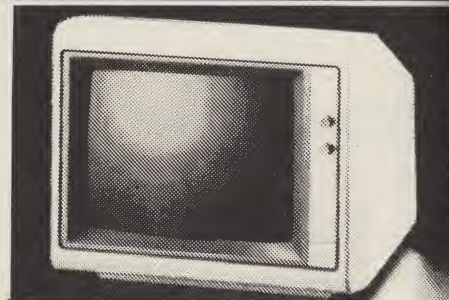
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## Contents

Mike Wright reviews the latest microdrive software overleaf and on page 163 antique dealer Alan Proctors shares his programming experiences.

# SINCLAIR BUSINESS USER

November 1984

## A long four years

THANK YOU for finding the time and space to review my **Building Price** program in the September issue.

I am pleased to see at last a start made with your *Sinclair Business User* to fill the need created by the ZX-81, Spectrum, and QL. It has been a long four years, for the few who took the plunge with the first ZX-81, waiting for the rest of the small businessmen and women to realize the benefit of the Sinclair computer and its future in the small business. In fact, the smaller the business the more the computer can help, as very often, especially in the building industry, the proprietor has to work on site and do the office work as well. I wonder how many fathers who have given their children a computer, try to do their office work in the evening, to the strains of **Jet Set Willy's** *If I was a rich man*.

The **Building Price** program has been in regular use for the last year and copes with most plans; I have just put through a plan for a small extension in less than 10 minutes. I have a microdrive which is a joy to use — it took me two years to write the program and it can load in nine seconds.

Long may you continue to support us Sinclair Business Users with your excellent magazine.

**John Redman,**  
Axbridge, Somerset.

## Record software

I SHOULD be interested to hear from anyone who is using one or more of the business programs on the market for the 48K Spectrum for running a small retail music tape/record business.

Postage and incidental expenses would be reimbursed.

**E Robinson,**  
Record & Tape Centre,  
6 Main Street,  
Cockermouth,  
Cumbria.

## Printing space

IN DUE COURSE I would like to set the copy for a monthly newsletter using a micro-computer and a proportional daisy wheel printer.

Presumably, to do that I would need a word processing package that will show the effect of proportional spacing on the display screen

— especially if columns are to be correctly justified. Is it possible to work in that way on the Spectrum or the QL, or indeed on any other popular micro?

**Charles Lane,**  
London W1N

● *Proportional spacing is possible on most word processors. For the Spectrum **Tasword 2** is the best and the QL is supplied with **Quill**. That is all you will need as the software produces the format of a document and not the printer.*

## Shop window

IN AN EARLIER issue of *Sinclair Business User* we asked for details of specialist programs of limited commercial value written by readers which might be of interest to other serious users. Details of programs will appear once only within *Sinclair Business User*. If readers would like details of their programs to appear regularly they can advertise in Sinclair Supermart at the back of the magazine.

**Blackboard.** Stores and solves equations without requiring any programming. It can contain 255 equations of up to 10 variables each. From VJB Software, 33 Merton Street, Bury, Greater Manchester BL8 1AW. Price £3.00 including p & p.

**Building Price.** Calculates the cost of constructing buildings and extensions, drawing a plan of the building after measurements have been entered. Contains more than 100K on two cassettes, price £15.00. Available from J Redman, Stevelon House, Slade Lane, Tarnock, Axbridge, Somerset BS26 2SH. Tel. Edingworth 518.

**Calendar.** Converts dates from Gregorian (European) to the Hegira (Islamic) calendar systems. Runs on 48K Spectrum, microdrive compatible, drives full-size or ZX printer. For further information contact E J F Austin, BAC Ltd, PO Box 2, Tabuk, Saudi Arabia.

**D J Words.** Versatile word processing program for 48K Spectrum with microdrive. Capable of 137 character per line in condensed mode. Enlarged, condensed, underlined, emphasized and italics modes available, as are tabulation, centralised and right justified print position and left margin changes. Fast text editing facilities. Priced at £13.80 including p & p, from D J Programs, Lawnspeedie, North Duffield, Selby, N Yorkshire. Tel (075 785) 615. A range of computer programs for farmers also available.

**School Fund, Class List.** A range of administrative programs for teachers, as well as educational and business software. For further information contact P Nethercot, 2 Chantry Close, Sunderland SR3 2SL.



Mike Wright reviews two products which explore the business potential of the Spectrum

# Microdrive pioneers

**M**ORE AND MORE business programs are, at last, advertising microdrive compatibility as a feature. Transform and Hestacrest are both companies which have released programs which go further and require not one but two microdrives.

**Invoicing/Accounting** from Transform is designed for a 48K Spectrum fitted with twin microdrives and an 80 column printer. It costs £25.00 — or £15.00 for owners of the present Invoicing program — and it bravely attempts to provide all the features of large business systems.

Somewhat strangely, it seems at first, the suite is supplied in a large plastic book type case containing two cassette tapes. The programs must be loaded from tape, customised for the user's interface and saved to microdrive. The infamous problems encountered with microdrive cartridge compatibility, where programs saved on one microdrive will not always run on another, have been a factor in Transform choosing to release the programs on cassettes, one for the ledger and one for the invoicing program, rather than on microdrive cartridges. On one side is a version for a Tasman interface. A version for other interfaces is on the other side.

The customised ledger and invoicing programs are saved onto different cartridges with a third being used for the shared data. When back-up copies of programs and data are made six cartridges are needed.

One feature is the inclusion of **Tas-wide** to give a 64 column screen display. Once copies of the programs have been made the data can be set up. The Accounts cartridge is placed in drive one and the data cartridge in drive two.

You select option D at first from the main menu to set the date which is printed on statements. That can be entered in any format required. Option U is used to enter details of the accounts

on the first run and to add new accounts in later runs. A flashing cursor is used to guide the user in setting up the account. The first input is an account name of up to 10 characters, although referred to as an account number. Next the name and address are entered and finally details of debits and credits — marked with a minus sign.

Once the details have been entered they are saved on drive two. When the data has been saved the option of making a back-up copy by replacing the data cartridge with another is given before returning to the main menu. The original data cartridge can then be replaced and a second account set up. Although it is safer to make the back-up copy at each stage you might find it more convenient when setting up accounts to enter the next account, then make a back-up copy of the whole cartridge once all accounts have been entered.

An account is updated by first loading it into memory using the save and load option then the load account option G of the save menu followed by Y to confirm the choice, before entering the account name.

Once an account has been loaded the screen shows the account reference, the name and address and a delivery name and address together with the last ten items on the account. An abbreviated menu is displayed at the bottom of the screen. Two lines of text can be printed on statements. Other options allow address labels to be added, the delivery address or statement cleared. Statements, address labels, delivery labels and remittance notes can be printed.

The invoicing program is used to set up and print invoices. The details from the invoice can be added to the accounts data at the push of a button and it is that feature which makes the programs an excellent buy for the business user. The invoicing program is loaded from the accounts program by replacing the accounts cartridge with the invoice cartridge and selecting option Q in the save

menu. The invoicing program will usually be run first and the data transferred to the accounts program. Once loaded the main menu is displayed, offering you options, among others, to change the VAT rate, add items to the price list and print that price list.

Your name and address, up to seven lines of 64 characters, and a price list of up to 200 items can be used in the



program. Each item is given a description and a VAT exclusive price. VAT at 15 per cent is calculated, added onto the price, and displayed.

An abbreviated menu is displayed at the bottom of the invoice. A flashing cursor prompts for entries to be made. The account reference is first. If an account has already been set up then the addresses are added automatically. The date, invoice number and a reference are entered next. Then the items are added, the quantity being entered first. Details and unit price are added either by typing or by entering the price list number. The cost is calculated and displayed. Entering 't' as a quantity calculates the total cost of the items. Details of postage, any discount, settlement discount and the VAT rate are added. Only one VAT rate can be used per invoice which could be a problem if your business deals in goods or services



which have different rates.

Finally, up to two lines of text can be printed at the bottom of the invoice. Those lines must be added, even as blanks, before the invoice is printed correctly with the discounts and VAT shown. Other options allow credit notes, orders or addresses to be typed, changes made to the invoice and there is even an option to clear all or parts of it. The invoice, address label and delivery label can all be printed from the invoice menu. The invoice details are added to the accounts data through option X. A warning is given if the data has not been added to the accounts.

Throughout the system the layout of the display and printouts is extremely clear and well-designed. That helps make the programs effective in speeding up the production of invoices and the accompanying accounts. Despite that, however, the programs have some disadvantages.

from drive one; a data cartridge is placed in drive 2.

On the first run the program is set up by prompting for your name and address, your security password, up to six different VAT rates and the type of interface to be used. Giving cash discounts and linking to the other programs are also catered for. On subsequent runs only your password is asked for and whether you are starting a new accounting period; if you are then the details of the last period's transactions are cleared from the data cartridge.

You can handle up to 50 sales analysis codes of 10 characters and 250 customers. Transactions are defined in four categories — invoices, credit notes, journals and cash (including discounts) — and are all entered from a subsidiary menu. Each time you select a transaction menu option in an accounting period the data is given a batch number;

At the end of an accounting period an option allows you to print the daybook, cash listing, journal listing, account statements, lists of debtors and customer address labels. Printing the daybook on an 80-column printer, will give you the customer name, account number, reference, item code, net and total amounts and the item description. On a ZX printer only the account number, item code, net and VAT amounts can be obtained.

The statements and debtors option of the period end menu allows statements to be displayed or printed, and a list of debtors with debts can be printed also. Your own or the customer's version of statements, headed with your name and address, can be printed too, showing the type of transaction, a reference, debit or credit and opening and closing balances.

You must use the end of run option before removing the cartridges from the microdrives. That updates the sales data cartridge and once it has been updated the program must be replaced in drive one with a third cartridge. That is formatted before an updated copy of the data, is made.

The program is very user-friendly after you overcome your initial irritation at loading the interface software every time and using the full load command instead of a run file. The ability to fix VAT rates individually is very useful as are the sales and VAT analyses. The printouts are clear enough although you might find them clumsy.

Both the Transform and the Hestacrest programs can be seen as another step forward in the drive to show that the Spectrum can be used very effectively in business, and although both have weaknesses whether or not those matter will depend on your requirements. They are the first programs to use microdrives as if they were disks. Other companies must surely follow when they see what can be achieved.

**Transform Ltd** 41 Keats House, Porchester Mead, Beckenham, Kent. Tel: 01-658 1661.

**Hestacrest Business Software** PO Box 19, Leighton Buzzard, Beds. LU7 0DG. Tel: 052-523 7785.

#### INVOICING/ACCOUNTING

Memory: 48K  
Price: £25.00  
Gilbert Factor: 8

#### SALES LEDGER

Memory: 48K  
Price: £32.00  
Gilbert Factor: 8

The first drawback is the number of microdrive cartridges needed if back-up copies — a necessity for business users — are to be made. It would be nice to see both programs on one cartridge. For some applications the lack of a sales analysis could also prove annoying. An update has been released that allows the sum of all accounts to be produced.

**Sales Ledger** for the 48K Spectrum, from Hestacrest Business Software, forms part of an accounting package which also includes a cash book and nominal ledger, each priced at £32.50 or £72.00 for all three. In contrast with the Transform software, Sales Ledger is supplied on microdrive cartridge.

The program supports full size printers with Centronics or RS232 interfaces as well as producing abbreviated printouts on a ZX printer. With a Centronics interface the driver software must first be loaded before the program is run

up to 40 batches and 1,000 transactions can be dealt with in any one period. Individual transactions of up to £100,000 and a total of £1 million can be handled.

When entering invoices and credit notes you are prompted for the customer's code number, a reference number, the analysis code, the amount excluding VAT and confirmation of the VAT amount. VAT is calculated from the first digit of the reference code which corresponds to a VAT code. A REF LOCK option, which repeats the customer code and reference number leaving you to enter the analysis code and amount, helps reduce typing.

Opening balances are entered using the input journal option of the transaction menu. That prompts you for the account code and amount. Cash transactions can be input either from the keyboard or by links to the cash book.



Cashflow problems? Kuma attempts to find the answer

# Domestic finances

**H**OME BUDGET from Kuma Computers is intended to help you plan your finances. The program is cassette based and has no manual or written instructions. Instead, a series of Help pages are included in the program.

You keep track of your finances by defining a 'year' and entering income and expenditure for each month. The amount entered can be a forecast to be updated later. Expenditure can be entered as one of 10 user-redefinable categories. On the first run the program eases the entry for each month by prompts. Entries can be changed using the back-up option which permits you to re-enter a previous entry.

Option 1 on the main menu allows you to add data or create a new file. It also has a special rolling budget feature which allows new files to be created using the existing data.

Entries for a particular month are displayed using option 2, which also shows the following month's data. The

results for any category can be displayed as a three-dimensional bar chart. Those allow you to define the vertical scale and they do look impressive. The effect, however, is lost when a chart is printed. A printout can be obtained from any of the display options by pressing P.

When the file is saved a six figure security code appears which must be re-entered when the data is loaded.



Though Home Budget is easy to use it cannot be described as user-friendly. The Help pages, which are a great idea, are not effective and the overall lack of instructions is disappointing. That is characterised by the back-up option, which does not make a spare copy but moves back one entry, which is not explained.

You will probably find the biggest obstacle to using the program lies in the fact that monthly totals of expenditure have to be entered. Since such information is not usually kept in that form a separate program such as **Finance Manager** may be needed to get category totals first.

**Kuma Computers Ltd** Unit 12, Horseshoe Park, Horseshoe Road, Pangbourne, Berks. RG8 7JW. Tel: 07357 4335.

## HOME BUDGET

Memory: 48K

Price: £5.95

Gilbert Factor: 5

## INTEGRATED BUSINESS SYSTEM FOR SPECTRUM 48K AND TWIN MICRODRIVES

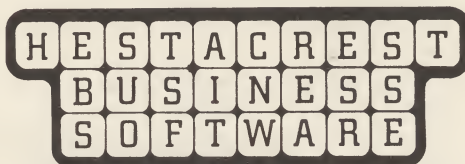
### PURCHASE LEDGER

Produces:  
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 ★ VAT Analysis  
 ★ Purchase Day Book  
 ★ Journal Listing  
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 1000 monthly transactions  
 250 supplier accounts  
**£32.50**

★ Professionally designed for twin microdrives  
 ★ Integrated or independent system  
 ★ Easy to operate with clear screen instructions  
 ★ Machine code routines for fast processing

### SALES LEDGER

Produces:  
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 ★ Day Book  
 ★ Sales Analysis  
 ★ VAT Analysis  
 ★ Journals Listing  
 ★ Cash Listing  
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 ★ Address Labels  
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 1000 monthly transactions  
 250 customer accounts  
**£32.50**



### CASH BOOK

Produces:  
 ★ Cash and Bank Summary  
 ★ Cash and Bank Receipts Listings  
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 ★ Receipts and Payments Analyses  
 1000 monthly transactions  
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 250 supplier accounts  
 250 customer accounts  
**£32.50**

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 ★ 64 characters per line screen display  
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Full details

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Microvitec PLC, Futures Way, Bolling Road, Bradford BD4 7TU, West Yorkshire. Tel: (0274) 390011. Telex: 517717





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**ESSEX** Harlow: Akhter Instruments. (0279) 443521.

**GLOUCESTERSHIRE** Cheltenham: The Screen Scene. (0242) 528979.

**HAMPSHIRE** Portsmouth: Advanced Digital Services. (0705) 823825.

**HERTFORDSHIRE** Watford: Computer Plus. (0923) 33927.

**HUMBERSIDE** Hull: The Computer Centre. (Humberside) Ltd. (0482) 26297.

**LANCASHIRE** Burnley: IMO Computer Centre. (0282) 57411/54299.  
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**LONDON W.1:** Specialist Computer Centre Ltd. 01-935 4150.  
Eltham: The Advanced Technology Centre. 01-859 7696.

**LINCOLNSHIRE** Grantham: Oakleaf Computers. (0476) 76994.

**MANCHESTER** Sumlock Electronics Services Ltd. 061-834 4233.

**MERSEYSIDE** Liverpool: Specialist Computer Centre Ltd. 051-236 3499.

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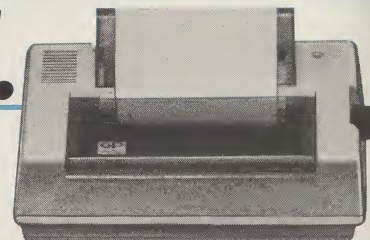
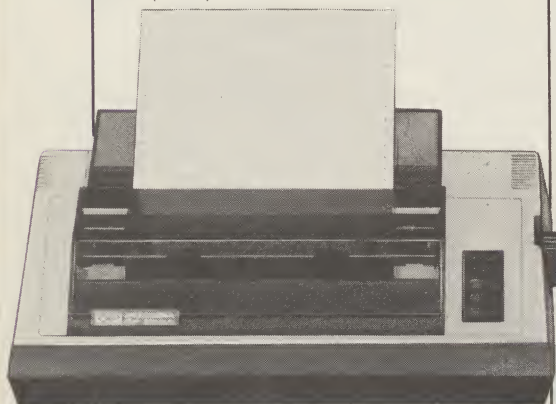
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**M**Y WIFE, SON AND I are employed in the buying, restoration and selling of antique furniture and clocks. As I am a retired civil engineer and my wife takes care of the sharp end of the business I am left to attend to such mundane things as shipping, administration and accounts.

Our business has a turnover which has peaked to around £250,000 per year but is usually around £200,000. We are a limited liability company so the requirements for the maintenance of accounting records and the production of final accounts at the end of a financial year are more stringent than for an unincorporated business such as a partnership or sole proprietor.

Antique dealers, in common with some other traders such as second hand car dealers, may be involved in Special Scheme VAT. The VAT due to the Customs and Excise is calculated on the margin between cost and selling price, not on selling price alone as is the case with the standard VAT scheme, operated by most other business concerns. That introduces a complication for financial accounts whereby purchase cost of individual stock items has to be held until a sale is made.

The cost of employing a bookkeeper — additional to audit fees which we cannot avoid — and a natural aversion to the grind of traditional double entry bookkeeping gave me the final excuse to persuade my wife we should invest in a computer. She agreed to a ZX-81!

That was two years ago. The system now comprises a Memotech 64K memory and parallel interface, a Dean Electronics keyboard, a Seikosha GP100A printer and a rapid load/save Eprom based on Q Save but faster. Without that ROM-based utility, which allows loading or saving the full 64K of memory in 1½ minutes, I do not think the ZX-81 can be seriously considered for general commercial application.

In describing the specification for my system I have to admit that it is a result of evolution during development rather than a system analysis followed by program production. With hindsight I have to admit that I rushed into program coding too early, due the urge to play with the computer. I should have spent more time on detailed system specification in the first instance.

Another lesson learned the hard way was the importance of flowcharting. That technique proved essential both in an overview of the general objectives and subsequently the detailed logic sequences prior to coding. Undoubtedly

## ZX-81 in the antique shop

Alan Proctor outlines the problems

had I been a trained systems analyst/programmer I would not have made those mistakes — but then neither would I be an antique dealer.

The system now consists of four program segments and two datafiles. All financial transactions are input into ACCTDATA data file by means of ACCTPROG. The principal data array records hold data in a number of categories which describe stock purchases or sales, administrative cost, capital accounts and cash receipts. The system accommodates both direct and credit transaction.

Each record contains the keys necessary to post to all relevant accounts from each transaction. For instance, the single record for purchase of goods on an individual purchase invoice with post, or printout, to purchase ledger, one entry; personal account of supplier, two entries if cash paid; and Bank, for cash account if payment is made at time of purchase. A provision for 1700 financial records has proved more than sufficient for the last financial year. Facilities are also included to deal with opening accounts, standing orders, monthly or annual, and if monthly, full or partial year payments. ACCTDATA contains all the information needed to produce, when needed, details of individual ledger accounts with full or partial listings, or just monthly balances, individual or administrative. Also End of Year final accounts, trial balance and

balance sheet.

Whilst the financial accounts do not require details of purchase and sale of individual stock items per se, those details are required to be kept in a specific form by Customs and Excise if the Special VAT scheme is being operated. Also the auditors require full information on all transactions in order to be able to do an audit trace on any constituent part of the accounts.

The additional details are maintained in SALEDATA. Each record in SALEDATA is based on an individual stock reference number. It contains a description of the item, date, details of purchase and sale, client and supplier, sales invoice number, VAT details and cost and sales prices. SALEDATA contains 750 records which have proved more than enough for one financial year.

When data has been input the file on line is ACCTDATA. Those aspects of data required for SALEDATA are transferred on input to low memory (12K — 16K) so that when the new generation of ACCTDATA is saved and the previous generation of SALEDATA is loaded, the data required is not lost.

On loading SALEDATA an instruction is given to STOP the recorder when the old generation is loaded. The data is then transferred into the SALEDATA records from low memory automatically. A further instruction is given

*continued on page 164*





*continued from page 163*

to restart the recorder on SAVE and the new generation of SALEDATA is created. That facility of using low memory is extremely useful for data transfer or program operating variables loading when the continued memory required of program and data files are close to 64K.

The SALEPROG segment of the system provides a means of interrogating SALEDATA for given current stock lists, current stock value, details of individual stock items, analysis by invoice number, customer, dealer or item, such as clocks, tables and so on, and reports on monthly transactions with a statement of monthly performance. That particular segment has proved extremely useful to me as a management tool.

The ACCTPRNTPROG segment provides the financial reports from the ACCTDATA records. Those include cash flow and bank balance reports and can also provide analysis of types of expenditure per ledger account. How often has the reader been requested by the tax inspector to provide an analysis of sundry expenses? That single byte in the record provides the facility to produce a full subsidiary analysis, often used by bookkeepers as the preliminary

to impersonal account posting.

An interesting feature of ACCTPRNPROG is that it employs an array to control the action to be taken in debiting and crediting accounts, attributing VAT to input or output, depending on the nature of the record. Due to insufficient memory, the array has to be saved in conjunction with ACCTPRNPROG after all other variables have been cleared, using the low memory transfer technique.

A further segment has been developed called INVCPROG. That produces a full invoice with file, invoice number, customer details and full item description. If for export, a shipping invoice is also produced. In that instance the initial data file loaded is SALEDATA. The autoloader from low memory subsequently being to ACCTDATA. Although almost complete, my wife and son consider a computer produced invoice is hardly in keeping with the image of an antique shop.

Developments in the world of computers are so fast that whilst my decision two years ago to go ahead with my own system was valid then, I am not sure whether it is so today. Whilst there are a number of financial packages available I do not know of any that cater

for Special Scheme VAT. I now have a working package of interactive programs using common data files which is based on output information I want, and an input format to suit me and my business.

I once, somewhat rudely, described the so-called computer specialist as a person who designs a very clever, computer-orientated solution and then seeks out someone whose problem could be made to fit it.

There are many problems for anyone introducing a computer into a small business. If I had made the decisions in our business, we might have had about 50 per cent of the programs completed, but probably no business life to apply them to.

I feel that for most amateurs, serious programming requires an application that borders on obsession. This can produce several strains into the domestic scene. On the other hand, the employment of a professional agent in producing custom-made software would probably result in a cost for software and hardware that the owner of a small business might find hard to justify.

*For further information about accountancy programs contact Alan Proctor, Windsor Antiques & Design, 80 High Street, Eton, Windsor, Berks SL4 6AF.*

Microdrive Microdrive Microdrive Microdrive Microdrive

**NEW**

## ZX Spectrum and QL Microdrive

### Storage Box £5.95



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# ALL-IN-ONE

**Spectrum Interface**

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Spectrum owners! Imagine what great use you could make of all these components. Rotronics have integrated them all into one attractively styled, compact unit. All the power and convenience of floppy disk can now be yours, but at a fraction of the cost.

## **A complete package**

Wafadrive is extremely versatile. Five major components are housed within this one unit — the micro interface, two 128K drives, RS232 serial and Centronics parallel ports. Also included in the package are a blank wafer and Spectral Writer — a superb word processor program. The micro interface forms the nerve centre of Wafadrive, controlling all its major functions. The dual drive configuration and the ability to connect standard peripherals directly provides professional system flexibility. All this without a mass of separate components and vulnerable cables. Wafadrive transforms your Spectrum into a very powerful system.

## **Speed, reliability and capacity**

The wafers contain an endless loop of specially developed magnetic tape driven at high speed past a read/write head. The result is fast access without data loss.

Three sizes of wafer are available with minimum formatted capacities of 16K, 64K and 128K. The 128K wafer costs £3.95.

Data transfer rate is approximately 2K per second. Access time is proportional to capacity. 16K wafers are ideal for program development, with the larger capacity wafers being more suitable for general use and archiving of completed programs and data. Mechanical longevity is assured by the use of high grade materials throughout and full interchangeability between machines is guaranteed.

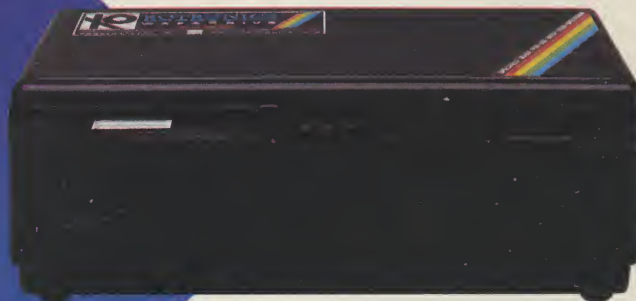
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for the 48K Spectrum

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— Gemini Cash Book, *Micro User*, August 1983

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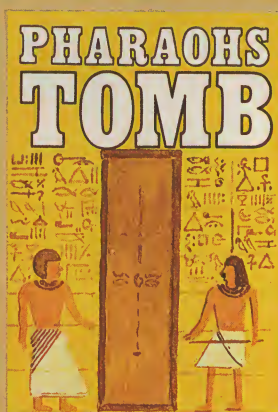
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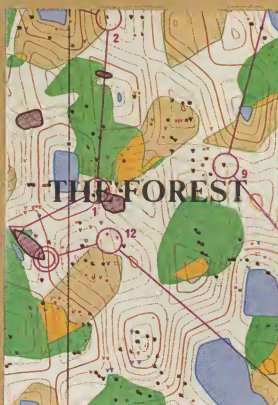
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## GLOSSARY

**Basic** — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.

**Bug** — an error in a program.

**EPROM** — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultraviolet light. The memory can then be re-programmed using an electrical device called an EPROM blower.

**Interface** — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.

**Kilobyte** — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.

**Machine code** — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.

**Mnemonics** — abbreviated instructions — for example LD for Load — used in machine language programming.

**Motherboard** — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.

**Port** — a link to the outside world which can be used by programs and the computer.

**PCB** — printed circuit board. A board which has on it the electronic circuits of the computer.

**RAM** — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.

**ROM** — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.

**Software** — programs which control the operation of the computer.

**Syntax error** — a bug caused by incorrect use of a programming language.



Our easy-to-follow guide for new owners

## The basic route to a habit-forming hobby

**B**UYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the QL computer is big enough for use in small businesses, the Sinclair computers are not really suitable for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a

few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson. Recent changes in the ULA should make more sets compatible.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

*continued on page 170*



continued from page 169

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD "" followed by NEWLINE; then increase the volume of

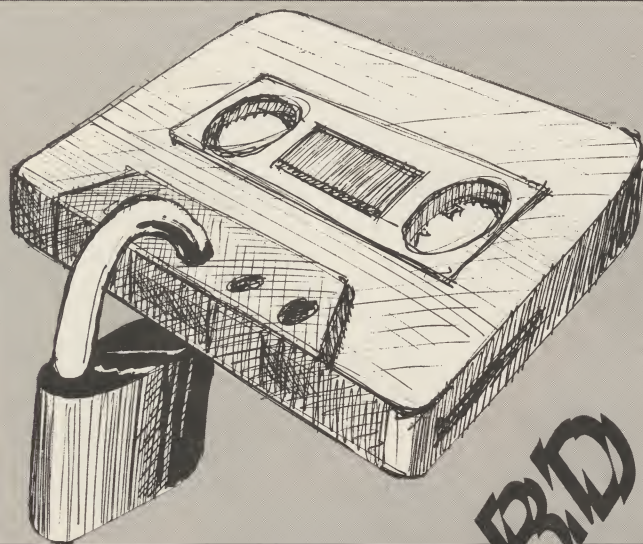
the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then rewind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.



PASSWORD

**P**ROTECT your programs from snooping eyes with this simple Basic routine by Hamish Barr of South Wirral. The program asks for a password, in this case 'eugene'. To use your own password simply alter the word 'eugene' in line 60, making sure you use six characters.

The program works by POKEing the number of lines at the bottom of the screen with the value 0. Since that is where error codes are printed, any attempt to BREAK the program will result in a systems crash until the correct password is entered, and the value is reset to 1.

The program can be used with any Spectrum, but please do not use it with programs that you want to send to us for publication!

```
5 POKE 23659,0
10 LET s$=""
20 PRINT AT 12,9;"ENTER PASSWO
RD"
30 PAUSE 0
40 LET a$=INKEY$: IF a$="" THE
N GO TO 40
45 LET s$=s$+a$
50 IF LEN s$<>6 THEN GO TO 30
60 IF s$<>"eugene" THEN PRINT
AT 1,5;"SORRY WRONG PASSWORD":
PAUSE 100: NEW
70 PRINT AT 16,14;"O.K.": PAUS
E 100
80 POKE 23659,1
90 CLS
100 REM REST OF YOUR PROGRAM
```



# DRIVER

## Starter Pack

**D**RIVER by D Gough of Ashton-under-Lyme in Manchester is probably the simplest playable game possible on the unexpanded ZX-81. You must use cursor keys 5 and 8 to control the car, avoiding the obstacles in your way.

### Variable used:

A: Holds the horizontal position of the car.  
S: Keeps the score.

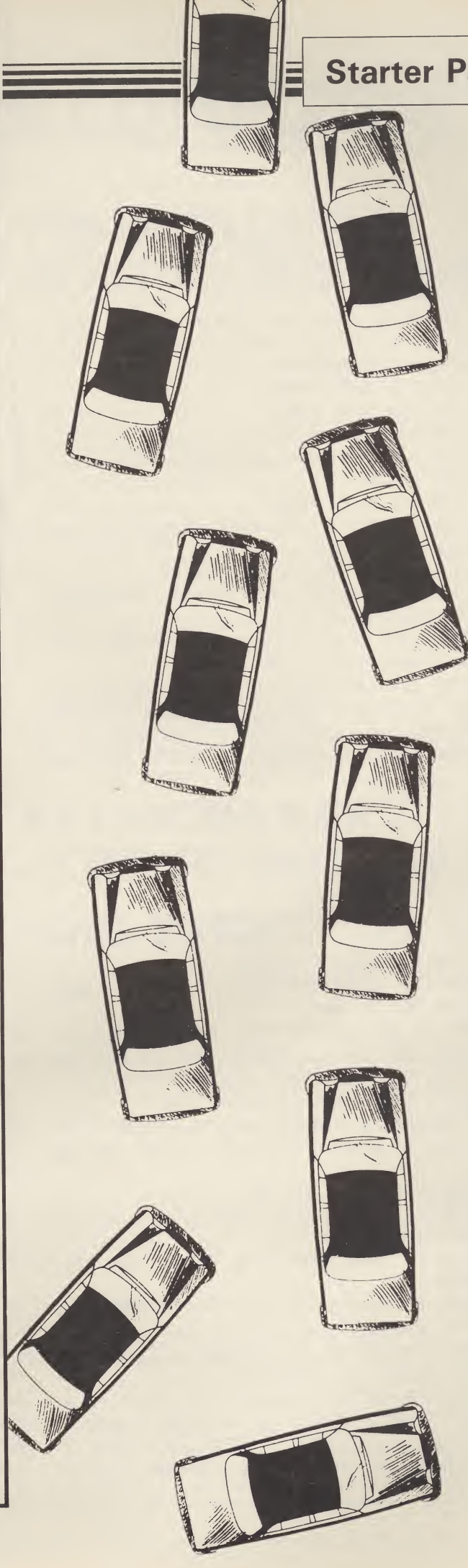
- Line 10 Sets the horizontal position of the car to 11, which is about a third of the way across the screen.
- Line 20 Sets the score to zero.
- Line 30 Prints one obstacle at line 21, the bottom of the screen, and at a random position along that line. The obstacle is represented by three asterisks.
- Line 40 Sets the print position at the same place as the position of the car. Before the car is printed to the screen, we must check to see that there is nothing already there. That will not happen the first time, but may happen later in the game.
- Line 50 This line is one of the most useful programming devices for the ZX-81. It looks directly at the bytes 16398 and 16399 in the systems variable area of the memory, which you would not usually use. Those stores contain the address of the square on the screen where the computer is to print the next character. It then looks at that byte to see whether there is already something there, in this case code number 23, which is the code number of the asterisk. You can find the code numbers for characters in Appendix A of your ZX-81 manual. So taken together, lines 50 and 60 set the print position to where the car should be printed next, and then check to see if there is an asterisk already on the screen in that position.
- If there is an asterisk there, then you have crashed, and the program jumps to line 120.
- Line 60 Prints the car at the pre-arranged print position, which we now know to be clear of obstacles.
- Line 70 Moves the whole display up one line, bringing the new obstacles closer to the car, and leaving room at the bottom for a new one. Any obstacles going off the top of the screen will be lost.
- Lines 80-90 Check the keyboard to see which keys you are pressing. If you are pressing five or eight then the position of the car must change, and A is adjusted accordingly.
- Line 100 Adds ten to your score.
- Line 110 Sends you back to the beginning of the main part of the program.
- Line 120 You have crashed so the computer prints out your score and then stops.

You could easily adapt the program, still in 1K, to make the game get harder as you play. One possible method would be to have a new variable, say A\$, containing the obstacle, and change that each time the score reached a particular level.

```

1 REM "DRIVER"
10 LET A=11
20 LET S=0
30 PRINT AT 21,INT (RND*26); "*"
**
40 PRINT AT 0,A:
50 IF PEEK (PEEK 16398+256*PEEK
K 16399)=23 THEN GOTO 120
60 PRINT " "
70 SCROLL
80 IF INKEY#="5" THEN LET A=A-
1
90 IF INKEY#="8" THEN LET A=A+
1
100 LET S=S+10
110 GOTO 30
120 PRINT AT 0,0:S

```





## Starter Pack

```
10 PRINT "The Black swan": PAU
SE 50
```

```
20 PRINT "On a warm Summer's d
ay the(6*sp)Black Swan swims gen
tly on his(2*sp)pond. A cloud of
gnats hovers(3*sp)lazily overh
ead. A hungry(6*sp)swallow is ch
asing the gnats.(3*sp)Help him c
atch his food by(6*sp)using the
cursors. Press any(4*sp)key to s
tart.": PAUSE 0
```

```
30 GO SUB 9000
```

```
40 GO SUB 8000
```

```
45 LET gnat=0: LET go=0
```

```
50 LET d=19: LET a=4: LET m=3:
```

```
LET n=28
```

```
55 GO SUB 7000
```

```
60 PRINT AT d,a;"(sp)AE";AT d+
1,a;"(sp)CD"
```

```
75 PRINT AT m,n;"(sp)"
```

```
80 LET m=m+(INKEY$="6" AND m<1
4)-(INKEY$="7" AND m>1)
```

```
90 LET n=n+(INKEY$="8" AND n<3
1)-(INKEY$="5" AND n>0)
```

```
95 IF INKEY$="5" OR INKEY$="6"
OR INKEY$="7" OR INKEY$="8" THE
N LET go=go+1: BEEP .005,30
```

```
100 IF SCREEN$ (m,n)="" THEN L
ET gnat=gnat+1: BEEP .008,40
```

```
110 PRINT AT m,n;"H"
```

```
112 FOR i=1 TO 4: NEXT i
```

```
114 LET a=a+1: IF a>23 THEN PR
INT AT d,a;"(2*sp)";AT d+1,a;"(2
*sp)": LET a=4
```

```
116 IF a<4 THEN LET a=4
```

```
120 PRINT INK 2;AT 0,8;"Gnats
caught(2*sp)"; gnat
```

```
160 IF gnat=30 THEN GO TO 1000
170 GO TO 60
```

```
1000 FOR f=0 TO 40: BEEP .008,f:
NEXT f: CLS : PRINT AT 11,0;"Th
e swallow ate all the gnats in "
;go;" swoops": PAUSE 150
```

```
1010 CLS : INPUT AT 11,2;"To pla
y again press ENTER"; LINE c$: G
O TO 40
```

```
7010 FOR i=1 TO 30
```

```
7020 LET y=2+INT (RND*12): LET x
=INT (RND*31)
```

```
7030 IF y=m AND x=n THEN GO TO
7020
```

```
7040 IF SCREEN$ (y,x)="" THEN G
O TO 7020
```

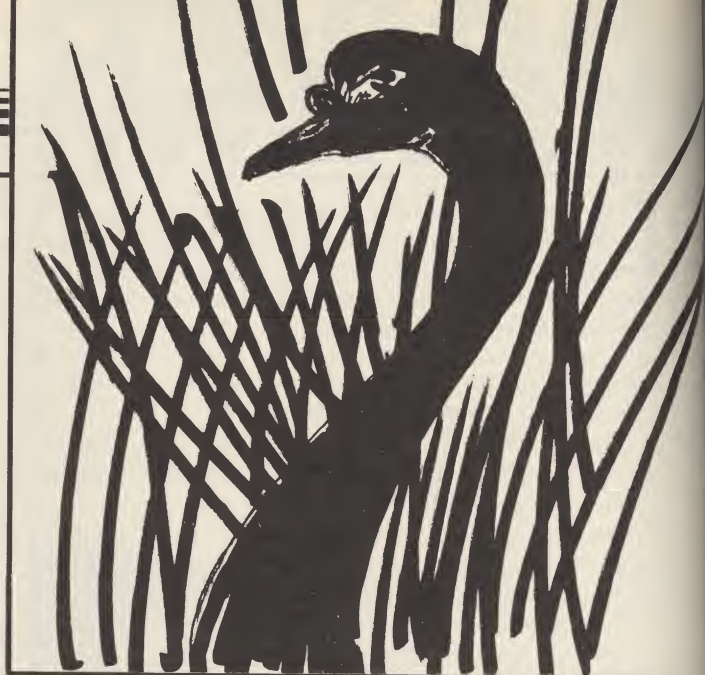
```
7050 PRINT AT y,x;"E"
```

```
7060 NEXT i: RETURN
```

```
8000 PAPER 6: BORDER 4: CLS
```

```
8010 FOR f=0 TO 31: PRINT INK 5
;AT 21,f;"(ig8)": NEXT f
```

```
8110 PRINT AT 19,1; INK 4;"E";AT
19,3; INK 4;"E";AT 19,26; INK 4
```



## BLACK SWAN

**E**XTREMELY effective use of the user defined graphics on the 16K Spectrum make this game by Michelle Presslie, of Dudley in the West Midlands, a pleasure to watch. You are a swallow who must eat as many gnats as possible in as short a time as you can, while below a black swan swims elegantly among the bulrushes.

The program uses our special abbreviations for graphics characters. Please read the instructions on the first page of Program Printout before typing in the program.

```
; "E";AT 19,28; INK 4;"E";AT 19,3
0; INK 4;"E"
```

```
8120 PRINT AT 20,1; INK 4;"E";AT
20,3; INK 4;"E";AT 20,26; INK 4
;"E";AT 20,28; INK 4;"E";AT 20,3
0; INK 4;"E"
```

```
8130 PRINT AT 18,1;"G";AT 18,3;
INK 4;"E";AT 18,26;"E";AT 18,28;
INK 4;"E";AT 18,30; INK 4;"E"
```

```
8140 PRINT AT 17,3;"G";AT 17,26;
"G";AT 17,28; INK 4;"E";AT 17,30
; INK 4;"E"
```

```
8150 PRINT AT 16,28;"G";AT 16,30
; INK 4;"E"
```

```
8160 PRINT AT 15,30;"G"
```

```
8200 RETURN
```

```
9000 FOR n=USR "a" TO USR "h"+7
```

```
9010 READ v: POKE n,v: NEXT n
```

```
9020 DATA 0,0,224,112,60,62,31,1
5
```

```
9030 DATA 0,48,120,104,124,102,4
8,56
```

```
9040 DATA 7,231,55,31,143,255,12
7,63
```

```
9050 DATA 204,238,255,255,255,25
4,252,248
```

```
9060 DATA 0,0,20,8,0,0,0,0
```

```
9065 DATA 16,16,16,16,16,16,16,1
6
```

```
9070 DATA 16,56,56,56,56,56,56,1
6
```

```
9080 DATA 1,5,106,220,60,2,1,0
```

```
9090 RETURN
```



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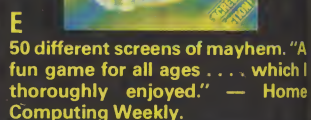


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# An object lesson for adventurers

Quentin Heath describes a simple system for creating complex adventures

**A**RTIFICIALLY intelligent characters can add atmosphere to any adventure game, but the most important parts remain the scenario and the objects it contains.

The most popular means of programming a scenario is to use a grid, first plotted on paper and then transferred to the computer either as a compact data block within a machine code program or an array within a Basic program. Such a

	1	2	3
A			
B	1000 1030 1060	2000 0 0	
C			

Figure 1. Argolian grid.

structure is shown in figure one which is the floor plan of an Argolian monastery. Each of the squares represents one move and the scale could be adjusted to make it one room or part of a room.

The floorplan in figure one does not contain any information about the locations. Instead it contains a list of numbers. These values are address pointers to various other lists which describe locations and events within them. In figure one, for instance, location B1 lists a series of numbers which in themselves mean nothing. To the adventure control program, however, each number has a meaning and they are:

room description = 1000

monster description = 1030

object description = 1060

When the program's movement routine places a player at room B1 in the monastery it needs a long location description in order to inform the player what is going on. It finds the number 1000 in that position on the list and then goes to the memory address where the room description is stored. When it has found it the program gives the information in figure two to the player.

The next action of the program, is to see if any objects are stored within the room. The object description for room B1 is placed at memory location 1060 and printed out after a location description. In the example the object is a small glass egg and the program would produce the printout shown in figure three.

If no object has been stored in a particular location the address indicator in the grid for 'object description' should contain a value which tells the program not to look for an object. The program may also change the value if an object is removed during play.

Using the grid system the task of programming a game is made easier because the program only needs to manipulate the grid of memory references and not the lists of descriptions.

The grid in the example is simple and more factors can, and should, be added to it. For instance, the fighting abilities of a monster who is known to haunt a room could be included in a list indicated by the location grid.

address	room	monster	object
1000	dark room		
1030		SmiKE	
1060			crystal egg
2000	chapel		
0			
0			

Figure 2.

These numbers, discussed last month in *Mind Games*, could be compared to player strengths and weaknesses when a fight takes place and changed as the monster wins or loses. If death occurs a zero can be placed in the reference grid.

The monastery shown in the example grid has only one level. It is, however, easy to develop a grid in which you can move to different floors.

Grids should be created as if they were being produced for a one level adventure but with one important difference. A new reference is added to the list for each location which indicates

whether there is a staircase in the room and in which direction, up or down, it goes. The grids are laid end to end in memory.

All the computer needs to do is look at the indicators on the list. If they are set to any number except zero there is a staircase in the room. The player is then asked whether a transition from one floor to another is required. If so, the program then switches to a different floor.

The example, which uses absolute RAM memory addresses, is for a machine code adventure program but by creating a series of arrays, one for each grid and one for each list of information, the grid reference system can be used within a Basic adventure program. The machine code addresses are translated into array elements and a three dimensional array can store any number of grids.

The grid reference system is simple to use and, with the techniques described in previous articles about character generation and manipulation, should enable a substantial artificially intelligent adventure game to be written.

Your are standing in a **DARK** room.  
There is a **CRYSTAL EGG** in the room  
which is guarded by a **SMIKE**.

Figure 3.





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I HAVE NOTICED a decrease in the number of questions from ZX-81 owners in the past year and so I have tended to concentrate on the Spectrum. This month I redress the balance.

The first question, from Mr Dave Harris of Abingdon, introduces the theme: **Can you explain the ZX-81 display file?"**

The area at the bottom of RAM between 16384 and 16508 holds the system variables and is followed by the program area, starting at 16509. The display file is next but as programs can vary in length, the display file does not start at a fixed address. The ZX-81 keeps track of it by storing the current value of the starting address in D-FILE.

If you look at page 178 of the manual you will see that the value of D-FILE is stored at address 16396 and so you might infer that you have only to look at the contents of 16396 to find the value of D-FILE.

Unfortunately, that is not true. Remember that the value of D-FILE is an address and that addresses are whole numbers, like 16384 and 17407 and 32767. A single location can only hold a number between 0 and 255 and so two adjacent locations are used to store large numbers. The value of D-FILE is given by: value in 16396 + 256\*value in 16397. Any whole number between 0 and 65535 inclusive can be stored using that system. The value held at an address can be found by PEEKing at it

# Moving displays in black and white

Andrew Hewson looks at the position of the ZX-81 screen display and shows how to produce headerless files on the Spectrum



and so you can PRINT the value of D-FILE by entering:

```
PRINT PEEK 16396 + 256*PEEK 16397
```

You may know that the contents of the first location in the display file is always 118 and you can show that by entering:

```
PRINT PEEK (PEEK 16396 + 256*PEEK 16397)
```

Similarly, the address of the end of the display is held in VARS — or more correctly is one less than the value in VARS — and can be PRINTed by entering:

```
PRINT PEEK 16400 + 256*PEEK 16401-1
```

Each line displayed on the screen is terminated by a byte containing decimal 118 and there is one more byte at the beginning of the file also containing 118. As there are 24 lines in the display, there are 25 bytes containing 118 and it is essential to the correct functioning of the display software that all 25 bytes are present.

With an unexpanded ZX-81 the display file consists of those 25 bytes and no more unless a LIST, PRINT or PLOT command has been executed since the last CLS or RUN command. That is a device to keep the display file as small as possible.

With a memory expansion pack of 4K or more the ZX-81 pads-out the display file with 32 bytes per line each containing zero — i.e., blanks.

Mark Wilson of Aberdeen writes:

**"Could you please tell me how to scroll the ZX-81 screen up, down, left and right?"**

To scroll the screen downwards or from side to side it is necessary to rearrange the contents of the display file in the appropriate logical fashion. There is one rule which must be obeyed whilst such rearrangements are in progress. It is that whilst running in SLOW mode the ZX-81 display file must contain at least 25 bytes holding 118 at all times. If that rule is broken the consequences are dire — the machine crashes and the only remedy is to pull out the plug and start again.

Tables 1 and 2 consist of programs to scroll the display from side to side and downwards respectively. A few simple alterations as shown to the program in table 1 will change the direction of scrolling from right to left to left to right as required. Similar changes could be made to the program in table 2 to scroll the screen upwards but I have not shown them because it is easier to use the SCROLL command.

The first program works as follows. Variables A and B are set to the values of D-FILE and VARS less one, that is to the addresses of the beginning and end of the display file respectively. Then each location in the display file is inspected in turn using variable I. If it does not contain 118 then the value in it is POKed into the location to the left or

*continued on page 182*

```

100 LET A=PEEK 16396+256*
    PEEK 16397
110 LET B=PEEK 16400+256*
    PEEK 16401-1
120 LET D=1
130 LET I=B
150 LET S=PEEK I
160 LET I=I-D
170 IF PEEK I=118 THEN GOTO
    200
180 POKE I+D,PEEK I
190 GOTO 160
200 POKE I+D,S
210 IF I=A THEN STOP
220 LET I=I-D
230 GOTO150

```

**Table 1. A program to scroll the ZX-81 display from left to right. To scroll from right to left alter lines 120, 130 and 210 as follows:**

```

120 LET D=-1
130 LET I=A
210 IF I=B THEN STOP

```

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continued from page 181

to the right — depending on the value set for D in line 120 — and the routine loops to line 160 to inspect the next location.

If a location contains 118 the value from the beginning of the line — stored in variable — is POKed into the adjacent location. That is the way in which a wraparound effect is achieved. A test is then made — line 210 — to see if the job is completed. The second program works in an analogous fashion.

Adrian Neilson of Dedridge, West Lothian writes: **“Please explain how to get a scan going across the screen which makes up a picture and the name of the game and then fills in with colour”**.

The technique is very straight forward and is explained in the Spectrum Manual but I have received several letters on the topic. The current Spectrum display can be SAVED at any time using either of the commands:

SAVE “name” SCREEN\$

or

SAVE “name” CODE 16384,6912

The display can be LOADED by entering any of the following:

LOAD “name” SCREEN\$

LOAD “name” CODE 16384,6912

LOAD “name” CODE

A particular problem with SAVEing and LOADING the screen is that the various commands and messages are also displayed on the screen. In doing so they prevent the programmer from having full flexibility in the way in which he constructs his display.

A way around the problem is to reserve space RAMTOP for a copy of the display by entering

CLEAR 58623

and to use the area to maintain a copy of the required display. A display which is SAVED from the upper area will automatically LOAD into the display file if the SCREEN\$ qualifier is used, i.e. the following pair of instructions are mutually compatible:

SAVE “name” CODE 58623,6912

LOAD “name” SCREEN\$

Lindsey Round of Chessington, Surrey has written to say: **“How do you create headerless files and save and load them on the Spectrum?”**

In normal operation all Spectrum cassette files are SAVED and LOADED in two parts. The first part is very short and specifies the name, type, length, and so on of the main part of the file. On reading the header the Spectrum checks that the name and type match that which it is looking for and displays

them on the screen. The remaining data are used by the main loading routine so that it knows where to place the incoming data and how much there will be of it.

The main saving and loading routines in ROM can be called directly from a machine code routine provided the correct parameters are passed in the appropriate Z80 registers. In that way headerless files may be written and read

to and from cassette.

Table 3 lists the various parameters and their interpretations and table 4 lists two routines which SAVE and LOAD the screen in that fashion. The routines can be loaded into the Spectrum using an assembler or using the simple decimal loader listed in table 5.

● Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.

```

100 LET A=PEEK 16396+256*PEEK 16397
110 LET B=PEEK 16400+256*PEEK 16401-1
120 LET C=I
130 IF PEEK (B-C)=118 THEN GOTO 160
140 LET C=C+1
150 GOTO 130
160 FAST
170 FOR I=B-1 TO A+C STEP -1
180 POKE I,PEEK (I-C)
190 NEXT I
200 FOR I=A+1 TO A+C-1
210 POKE I,0
220 NEXT I
    
```

Table 2. A program to scroll the ZX-81 display downwards.

	To Save	To Load
Carry flag status	Clear	Set
A register contents	255 (ffh)	255 (ffh)
IX register contents	Address to SAVE from	Address to LOAD to
DE register contents	Number of bytes to SAVE	Number of bytes to LOAD
Address of ROM routine	1218 (04c2h)	1366 (0556h)

Table 3. Parameters of Spectrum routines to SAVE and LOAD headerless files.

Decimal	Assembler	Comment
167	AND A	Clear carry
62 255	LD A,255	Load A with 255
221 33 0 64	LD IX,16384	SAVE from 16384
17 48 24	LD DE,6192	Length 6192
205 194 4	CALL 1218	Call SAVE routine
201	RET	Return
55	SCF	Set carry
62 255	LD A,255	Load A with 255
221 33 0 64	LD IX,16384	LOAD 16384
17 48 24	LD DE,6192	Length 6192
205 86 5	CALL 1366	Call LOAD routine
201	RET	Return

Table 4. Two Spectrum routines to SAVE and LOAD the screen display to and from a headerless file.

```

10 LET I=23296
20 INPUT J
30 POKE I,J
40 PRINT I, PEEK I
50 GOTO 20
    
```

Table 5. A simple Spectrum program for loading decimal code into the printer buffer. When used to store the routine in Table 4 the routines can be called at addresses 23296 and 23310.



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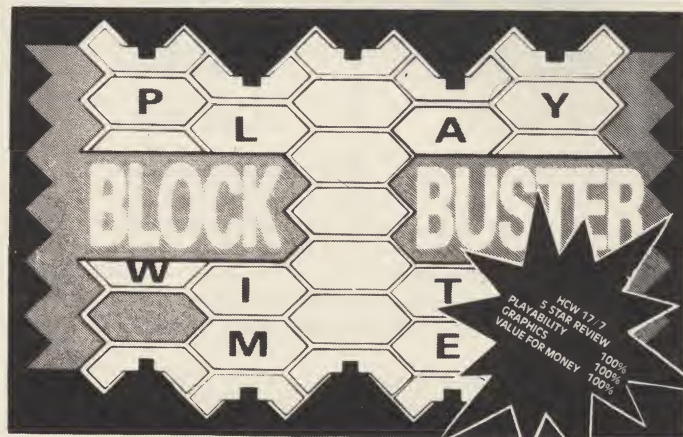
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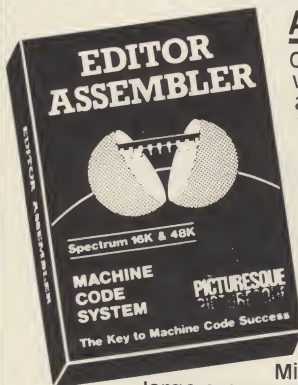
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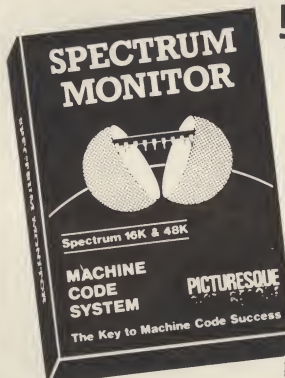
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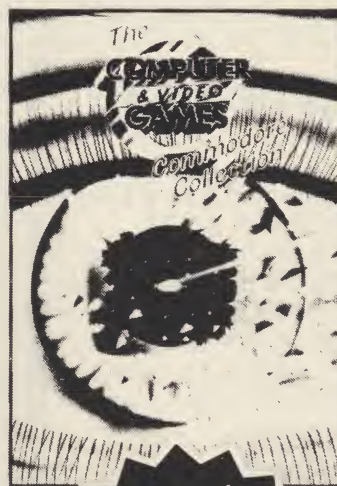
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## Britain

**Aylesbury Computer Club:** 12 Long Plough, Aston Clinton, Aylesbury, Bucks.

**Aylesbury ZX Computer Club:** Ken Knight, 22 Mount Street, Aylesbury (5181 or 630867).

**Basildon:** Roundacre Microcomputer Users' Club. J Hazell, Basildon 285119/416333. Meetings every Wednesday 7.30 to 10.30pm.

**Blackburn Computer Club:** 1 Sutton Street, Feniscowles, Blackburn, Lancashire. Tel: B'burn 60033 (office hours) or 28127. Meets twice a month, subscription £5 (£3 juniors).

**Bristol Yate and Sodbury Computer Club:** 99 Woodchester Yate, Bristol, BS17 4TX.

**Cardiff ZX Club:** Steve Smith (0222) 593237 or Mike Hayes (0222) 371732. Meets twice a month.

**Colchester Sinclair User Group:** Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.

**Computer Club International,** 6 Drumdoon Walk, Downpatrick, N. Ireland BT30 6UF.

**Cornard Sinclair User Group:** Neil MacDonald, 15 Potkiln Road, Great Cornard, Sudbury, Suffolk CO10 0DA.

**Crews and Nantwich Computer Users' Club:** J E A Symondson, 46 London Road, Stapeley, Nantwich, Cheshire CW5 7JL.

**Daventry & District Computer Club:** c/o Daventry Ex-servicemen's Club, Market Square, Daventry, Northants.

**Doncaster and District Micro Club:** John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357.

**Eastwood Town Microcomputer Club:** E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

**Edinburgh:** Edinburgh Home Computing Club. John Palmer (031 661 3183) or Iain Robertson (031 441 2361).

**EZUG-Educational ZX-80-81 Users' Group:** Eric Deeson, Highgate School, Birmingham B12 9DS.

**Furness Computer Club:** R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverston 55068). Meets every other Wednesday.

**Glasgow ZX-80-81 Users' Club:** Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241).

**Gloucester:** Mid-weekly Spectrum User Group. Barry Ledbury, 8 Linnet Close, Gloucester GL4 9XA (0452) 23186.

**Gravesend Computer Club:** c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

**Hassocks ZX Micro User Club, Sussex:** Paul King (Hassocks 4530).

**Hobbit Appreciation Society,** 12 Middlefield Lane, Hinckley, Leicestershire LE10 0RB. Free newsletter with SAE.

**Independent QL Users Group;** Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes MK11 1JU. Tel: 0908 564271. Publishes newsletter.

**Inverclyde ZX-81 Users' Club:** Robert Watt, 9 St. John's Road, Gourrock, Renfrewshire PA19 1PL (Gourrock 39967). Meets every other Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

**Keighley Computer Club:** Colin Price, Redholt, Ingrow, Keighley (603133).

**Lambeth Computer Club:** Robert Baker, 32 Heatherington Road, London SW4 7NX.

**Liverpool ZX Club:** Meetings every Wednesday 7pm at Youth Activities Centre. Belmont Road, Liverpool 6. Keith Archer, 031-236 6109 (day-time).

**Llanelli Computer Club:** 40 Tan-Y-Bryn, Burry Port, Dyfed. Llanelli 56917.

**Manchester Sinclair Users' Club:** Meets every Wednesday, 7.30pm, at Longsight Library, 519 Stockport Road, Longsight — 061-225 6997 or 061 445 6316.

**Meopham:** National ZX Spectrum User Club. Guy Fullalove, Woodcotes, Camer Park, Meopham, Kent DA13 0XS. Bi-monthly newsletter, subscription £1.50. Send SAE for details.

**Merseyside Co-op ZX Users' Group:** Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

**Micro Users' Group:** 316 Kingston Road, Ewell, Surrey KT19 0SY.

**Mid-Kent Micro Club:** Meets once monthly. Enquiries to M Gates, 65 Buckland Road, Maidstone ME16 0SH.

**Mill Lane Association Computer Group:** Bryan McAlley, 1 Cowleaze, Chinnor, Oxfordshire. (0844) 52426.

**Newcastle (Staffs) Computer Club:** Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30. Enquiries to R G Martin (0782 62065).

**North Hertfordshire Home Computer Club:** R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

**Northern Ireland Sinclair Users' Club:** P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

**North London Hobby Computer Club:** ZX users' group meets at North London Polytechnic, Holloway Road, London N7 Monday, 6pm.

**Nottingham Microcomputer Club:** ZX-80-81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

**Orpington Computer Club:** Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

**Perth and District Amateur Computer Society:** Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

**Regis Amateur Microcomputer Society:** R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

**Roche Computer Club:** 8 Victoria Road, Coop Rooms, Roche, Cornwall: 0726 890473. Twice weekly meetings, Monday and Friday.

**Saltcoats Computer Club:** Colin Borland, 117 High Road, Saltcoats, Ayrshire KA21 5SD. Weekly meetings.

**Sinclair Postal User Group:** 24 St. Mary's Way, Code SUL, Chigwell, Essex IG7 5BX. Produces magazine with competitions.

**Scunthorpe ZX Club:** C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

**Sheffield:** South Yorkshire Personal Computing Group. R Alderton (0742 20571), S Gray (0742 351440), P Sanderson (0742 351895).

**Sinclair Amateur Radio User Group:** SAE or two IRCs for details. Paul Newman G4 INP, 3 Red House Lane, Leiston, Suffolk IP16 4JZ.

**Sittingbourne:** Anurag Vidyarth (0795 73149).

**St Albans:** Bi-monthly meetings and a magazine. Details from Adam Slater, 40 Watford Road, St Albans, Herts AL1 2HA. (0727 54176).

**Stratford-on-Avon Computer Club:** Meets on the second Wednesday of every month. Telephone: 0789 68080 for details.

**Swansea Computer Club:** B J Candy, Jr Gorlau, Killay, Swansea (203811).

**Swindon ZX Computer Club:** Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

**Sutton:** Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.

**Washington Sinclair Users' Club,** Columbia Community Centre, Tyne and Wear. Meets twice a month, tel. 4179433 or 4167367.

**West Sussex:** Midhurst and District Computer User Group. Enquiries to V Weston (073 081 3876), R Armes (073 081 3279).

**Worle Computer Club:** S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068).

**Universal ZX Club:** Postal club for Spectrum owners in the U.K. and abroad. C. Shaw, 1 Swiss Walk, Batley, W. Yorkshire.

**ZX-Aid:** Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

## Overseas

**Australia:** Australian ZX Users' Newsletter, incorporating QL User. Paul Janson, P.O. Box 397, Dapto 3530, Australia. Also seeks unpaid contributions for the newsletter.—W.A. ZX Users' Group, Garth Gregson, 34 Chester Street, South Fremantle 6162. Phone 3351671.

**Austria:** ZX User Club, Thomas Christian, c/o Wissenschaft Forscht e. V., Postfach 141, A1190 Vienna. Meets every first Friday of the month. Telephone 0222-44 32 050 for details.

**Belgium, France and Luxembourg:** Club Micro-Europe, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (32/2/6537463).

**Denmark:** Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 45 24 66.

**ZZ-Brugergruppen i Danmark,** Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.

**J Niels-Erik Hartmann,** OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.

**Finland:** ZX-kerho, c/o Kalevi Hamalainen, Siltakatu 9 A 8, 33100 Tampere 10, Finland. Phone 35831-34238. Publishes quarterly paper.

**France:** Yves Chapron, no. SUS-1047, Rue du Puy, La Terrasse, 38660 Le Touvet, France. Specifically for users in the Alps.

**Germany:** ZX Club, a postal club; contact Aribert Deckers, Postfach 967, D-7000 Stuttgart 1, West Germany.

**Greece:** Athens Spectrum Club, Paris Stamelos, Spetsou 2, isi22 Marousi, Athens, Greece.

**Indonesia:** Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

**Irish Amateur Computer Club:** Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

**Irish Sinclair Users Club:** PO Box 1238, Dublin 1. Publishes a newsletter. Send SAE for details.

**Italy:** Sinclair Club, Via Molino Vecchio 10/F, 40026 Imola, Italy.

**Genova Sinclair Club;** Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

*continued on page 186*



## Club Corner

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**Micro-Europe:** Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

**The Netherlands:** Clive's Bits and Bytes, Nicholas Beets Straat 164, 6416 VX Heerlen. Telephone 045-423024. Both Spectrum and ZX-81 users welcome.

**Republic of Ireland:** Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

**Singapore:** Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

**South Africa:** Johannesburg ZX-80-81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg. Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.

Dumont and Syndercombe Amateur Computer Club. Jean-Pierre Dumont would like to correspond with ZX-81 owners via tapes. Write to 8 Kipling Road, Farrarmere, Benoni 1500, Transvaal.

**ZX SA Club:** Jonathan Jones, House 14, Anglo Alpha PO Box 15, 1725 Roodepoort.

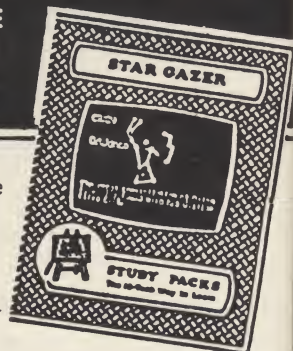
**Spain:** Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain. ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

**Swedish ZX-club:** Sinclair Datorklubben, Box 1007, S-122, 22 Enskede.

**United States:** Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).—SAF Users' Group, 2749 Eden Road, Leslie, Michigan 49251.—ZX Users Group of New York, Box 560 Wall Street, New York, N.Y. USA 10005. Subscription \$15US, publishes international newsletter. Seeks newsletter exchange with other groups.

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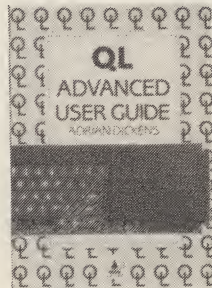
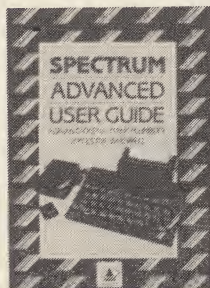
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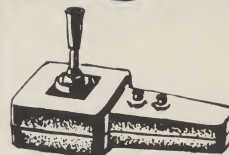
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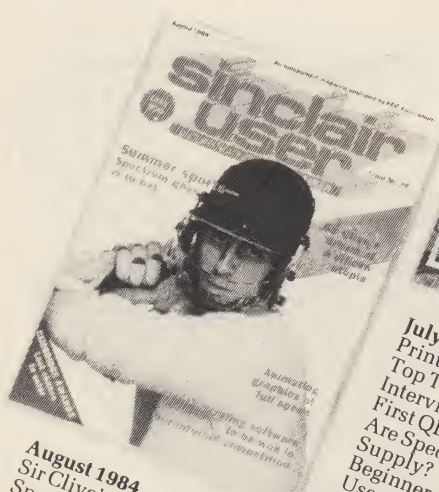
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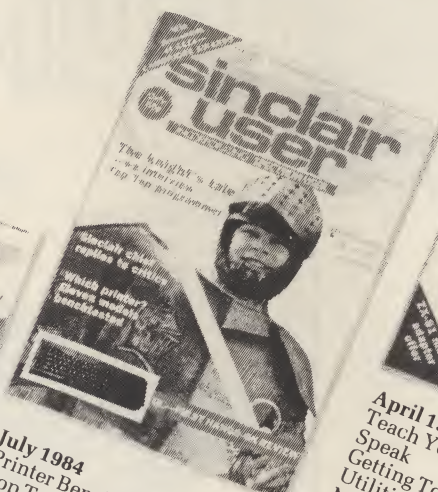
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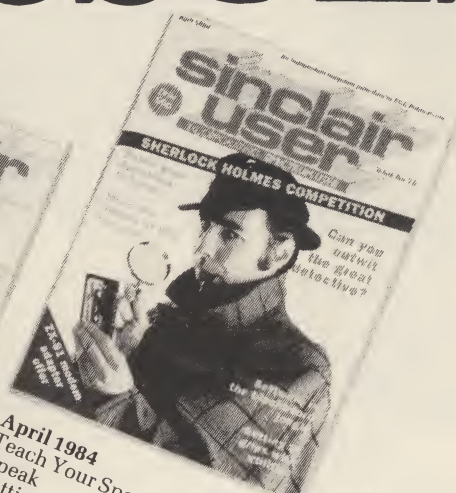
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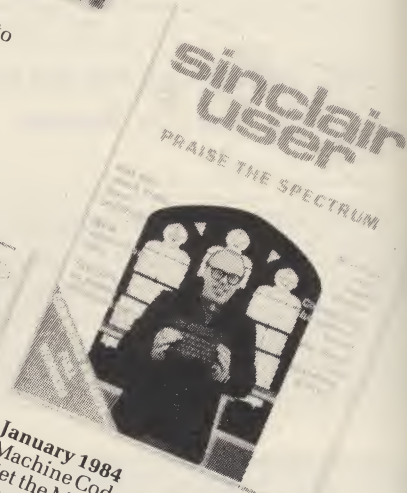
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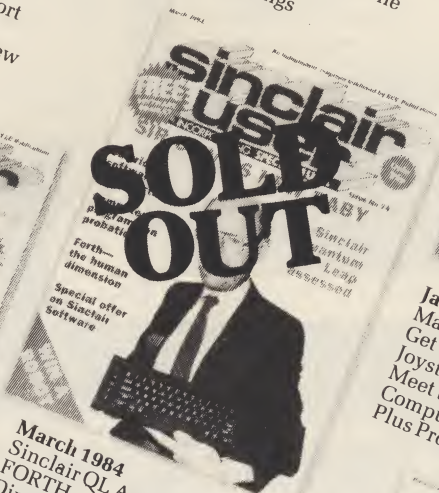
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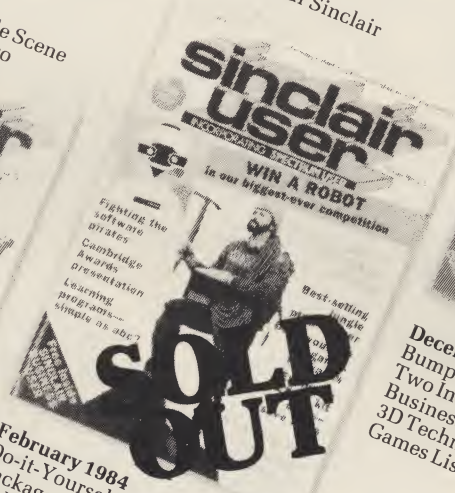
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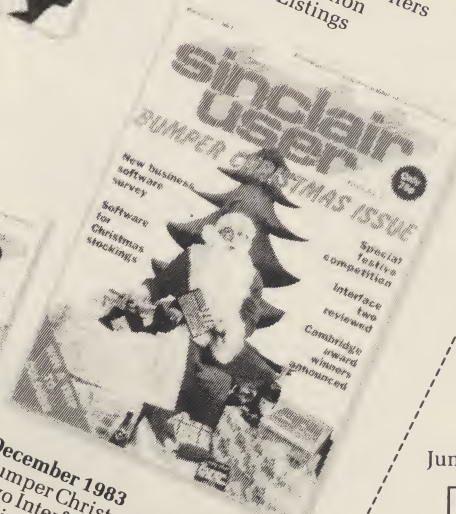
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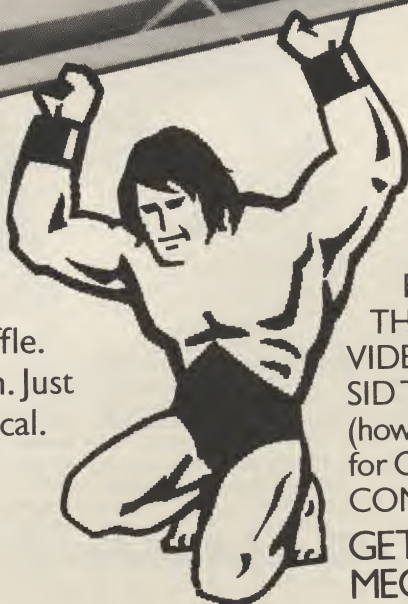
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THE FALL GUY (exciting new games),  
VIDEO DISEASES (how to cure them),  
SID THE COMMODORE SOUNDCHIP  
(how he does it), PLUS a host of games programs  
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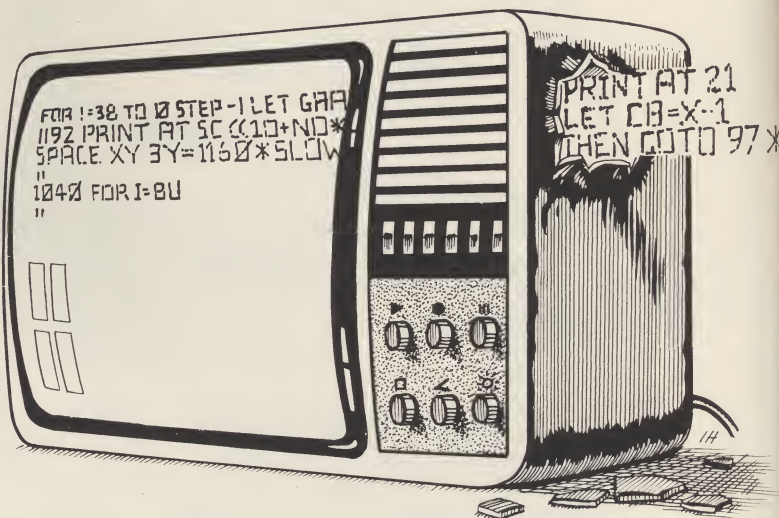
# ENOUGH TO BLOW ANYONE'S FUSE.

Every month, SINCLAIR PROGRAMS features extensive listings for the Sinclair Spectrum and ZX81, as well as graphics instructions, letters, 'game of the month', and even a special section for beginners. See you in a month's time!

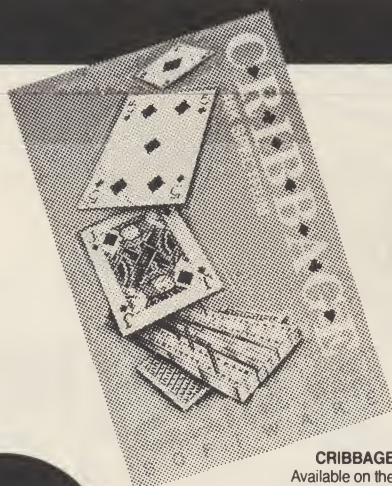
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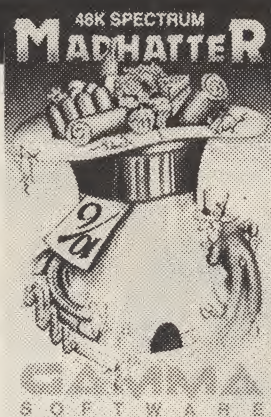


**"DEALER &  
EXPORT  
ENQUIRIES  
WELCOME"**

**CRIBBAGE**  
Available on the Spectrum for the first time. **CRIBBAGE** is an excellent version of the popular card game. As well as superb graphics, the game includes full rules and playing instructions together with automatic scoring and score re-view.

Playing against the computer, the experienced player and novice find **CRIBBAGE** an entertaining and challenging game.

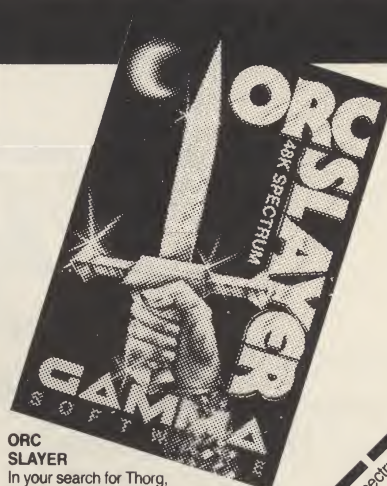
Available from Leisure Soft, Center Soft and all good retailers



**MADHATTER**  
"I must get this place tidied before my guests arrive," wails the **MADHATTER**. Help him collect his tea time treats for his Un-Birthday Party. "But watch out for those mice!" he warns, "and keep away from those vacuum cleaners!"

Looks like the **MADHATTER** will be in for a busy afternoon - will everything be ready in time?

**GAMMA  
SOFTWARE**



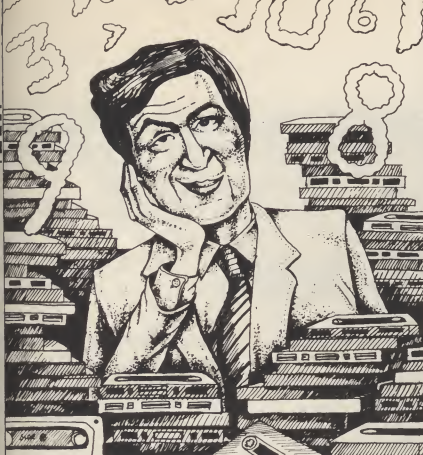
**ORC SLAYER**  
In your search for Thor, leader of the Death Moon Tribe of Orcs you must first find the Magic Runesword needed to destroy him and then seek out their underground stronghold somewhere in the Savage Lands.

Full of excitement, this adventure will push you to the limit of your wits and intelligence in achieving your goal.

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NW6 7AS





If we have reviewed a program we have given it a rating known as the Gilbert Factor, named after our Software editor, John Gilbert. That factor includes clarity of instructions, speed of operation, ease of use, originality, lasting appeal, use made of graphics and sound, and success in accomplishing stated aims.

## ZX-81

### Adventure

Adventure	Bug-Byte	6
Adventure 1	Abersoft	6
Black Crystal	Mastervision	7
Dungeons of Doom	Woosoft	*
Espionage Island	Artic	*
Greedy Gulch	Phipps	7
Inca Curse	Sinclair	*
Knight's Quest	Phipps	*
Lost Island	JRS	*
Magic Mountain	Phipps	*
Merchant of Venus	Crystal	7
Pharaoh's Tomb	Phipps	*
Pimania	Automata	6
Secret Valley	Newsoft	*
Serpents Tomb	Vortex	*
Ship of Doom	Artic	7
The Great Western	New Soft	*
Time Bandits	New Soft	*
Tomb of Dracula	Felix	*
Trader Trilogy	Quicksilva	6
Volcanic Dungeon	Mastervision	5
World of Illusions	Contrast	4

### Arcade

Alien Dropout	Silversoft	*
Asteroids	Silversoft	8
Asteroids	Software Farm	6
Astral Convoy	Vortex	*
Bank Robber	Romik	6
Bears in the Wood	Unicorn	6
Bubble Bugs	Romik	6
Byter	Protek	*
Cassette 1	Orwin	7
Cassette 2-5	Orwin	7
City Patrol	Sinclair	7
Damper	Quicksilva	7
Defenda	Quicksilva	8
Door Slammer	Cathedral	7
Forty-Niner	Software Farm	9
Froggy	DJL	7
Full-screen Breakout	New Generation	*
Galactic Trooper	Romik	6
Galaxians	Quicksilva	6
Galaxy Jailbreak	Romik	6
Games 2	JRS	*
Games Tape 1	J K Greye	*
Games Tape 2	J K Greye	*
Games Tape 3	J K Greye	*
Gamestape 1	Fawkes Computing	7
Glooper	Quicksilva	7
Gloops	Quicksilva	5
Gobbleman	Artic	*
Gobbler	Software Farm	*
Grand Prix	dk'tronics	*
Gulp 2	Campbell	*
Hang Glider	S Electronics	6
Hickstead	CCS	5
High-resolution Invaders	Odyssey	*
Invaders	Abersoft	*
Invaders	Bug-Byte	5
Invaders	Odyssey	8
Invaders	Selec	7
Invaders	Silversoft	*
Krazy Kong	PSS	*
Maze Death Race	PSS	*
Maze Man	Abersoft	*

Mazogs  
Micro Mouse  
Namtar Raiders  
Night Gunner  
Puckman  
Sabotage  
Six Games  
Space Raiders  
Space Trek  
3D Monster Maze  
Three Games Cassette  
Zuckman  
ZX Invasion Force  
ZX Panic  
ZX-81 1K Games Pack  
ZX-81 Pocket Book

### Business

Accounts (Limited company)  
Accounts (Sole Trader)  
Business Bank Account  
Critical Path Analysis  
Draft  
Mailing List  
Payroll  
Payroll  
Payroll  
Personal Banking System  
Purchase Ledger  
Sales Day Book  
Sales Ledger  
Text

### Education

Calpac 1-2  
Four Rules of Number  
Integration  
Intermediate English 1-2  
Intermediate Maths 1-2  
Language Devel. Series  
Language Devel. Series  
Linear Programming  
Matrix Operations  
O Level Chemistry  
O Level French Revision  
O Level Maths Revision  
Polynomials  
Primary Arithmetic  
Regression  
Self-teach Program

### Language

Forth  
ZX Forth

### Practical

Ephemeris  
Football Pools  
Poolster

### Puzzle

Nowotnik Puzzle  
Word Fit

### Simulation

Fighter Pilot  
Flight Simulation  
Pilot  
Print Shop

### Strategy

Airline  
Auto Chef  
Battleships  
Conflict  
Cyborg Wars  
Dallas  
Dictator  
Farmer  
Football Manager  
Fort Apache  
Galaxy Conflict  
Great Britain Ltd  
Ocean Trader  
Pioneer Trail  
Racehorse Trainer  
Racing League

### Traditional

Do Not Pass Go

Bug-Byte  
Lothlorien  
Artic  
Digital Integration  
Hewson  
Sinclair  
A Stubbs  
Sinclair  
JRS  
New Generation  
McGraw Hill  
DJL  
Artic  
Selec  
Crystal  
Phipps

Hestacrest  
Hestacrest  
Transform  
Hilderbay  
Myrmidon  
Hestacrest  
Hilderbay  
Soft Tech  
Soft Tech  
V&H Computing  
Hilton  
Hestacrest  
Transform  
Hestacrest  
Contrast

Calpac  
Micro Master  
University  
Rose  
Rose  
Glasson  
Micro Master  
University  
University  
University  
Calpac  
Rose  
Rose  
University  
Rose  
University  
Anvil

Sinclair  
Artic

Bridge  
Hartland  
Naigram

Phipps  
Ram Writer

Digital Integration  
Sinclair  
Hewson  
CCS

CCS  
CCS  
JRS  
Martech  
Stratagem  
CCS  
Bug-Byte  
CCS  
Addictive Games  
Contrast  
Martech  
Hessel  
Quicksilva  
Quicksilva  
G Barker  
Racing League  
Software

Work Force

8 Lynchmob  
7 Original Superchess  
8 Tai  
5 Tenpin  
\* ZX 1K Chess  
6 ZX Compendium  
5 ZX-Chess I

### Utility

9 Graphics  
8 Graphics Toolkit  
8 HI Resolution  
\* Machine Code Test Tool  
4 MCoder  
9 Programme Enhancement  
\* Package  
\* Renumber Delete  
\* Trace  
\* ZX Compiler  
\* ZX Screenkit  
6 ZX-81 Remload  
\* ZX-Bug  
\* ZX-sideprint  
\* ZXAS  
\* ZXDB

## SPECTRUM 16K

### Adventure

Android One	Vortex	*
Escape	New Generation	8
Mines of Saturn/Return to		
Earth	Mikro-Gen	*
Moria	Severn	*
Planet of Death	Artic	6
Secret Valley	New Soft	*
The Great Western	New Soft	*
Time Bandits	New Soft	*

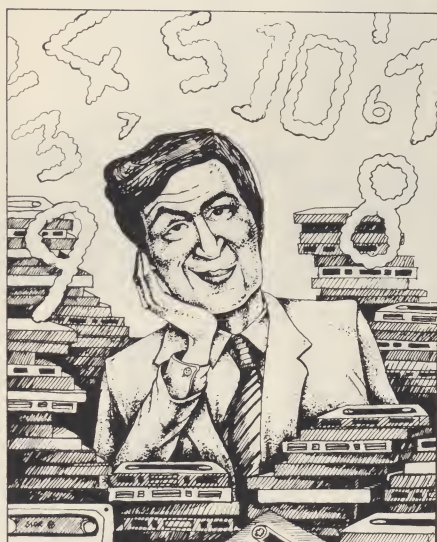
### Arcade

Aquarius	Bug-Byte	6
Arcadia	Beau Jolly	5
Arcadian	J K Greye	6
Assassin	Spectrasoft	*
Avenger	Abacus	5
Baron	Temptation	*
Base Invaders	Imagination	*
Black Hole	Quest	6
Blind Alley	Sunshine	7
Bug Blaster	Crystal	*
Cassette A	Orwin	*
Caterpillar	CDS	*
Cavern Fighter	Bug-Byte	4
Centi-Bug	dk'tronics	*
Children's Compendium	Dymond	*
City Defence	Mikro-Gen	*
Colour Clash	Romik	4
Cookie	Ultimate	*
Cosmic Guerilla	Crystal	8
Crazy Cranes	Voyager	5
Creepy Crawler	Mikro-Gen	*
Crevasse and Hotfoot	Microsphere	7
Cruising	Sunshine	4
Cyber Rats	Silversoft	7
Death Chase	Micromega	6
Demolition	Comp. Rentals	*
Destroyer	Winters	*
Di-lithium Lift	Hewson	3
Digger Dan	Ocean	*
Doombugs	Work Force	8
Dymonoids	Dymond	*
Earth Defence	Artic	5
Ed-On	Add-On	4
Eskimo Eddie	Ocean	*
Family Games Pack	Hornby	*
Fireflash	Abacus	5
Froggy	DJL	7
Fruit Machine	dk'tronics	6
Galactians	dk'tronics	*
Galactic Trooper	Romik	3
Galactic Warriors	Abacus	6
Galaxians	Artic	6
Ghost Hunt	PSS	*
Gnasher	Mastertronic	4
Gobble-a-Ghost	CDS	*
Gobbleman	Artic	*
Godzilla and Martians	Temptation	7

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# Software Directory



Ground Attack	Silversoft	6
Gulpman	Campbell	*
Haunted Hedges	Micromega	6
Hopper	PSS	6
Horace and the Spiders	Sinclair	8
Horace Goes Skiing	Sinclair	8
Hungry Horace	Sinclair	8
Invasion Force	Artic	8
It's the Wooluf	Crystal	5
Jet Pac	Ultimate	8
Labyrinth	Axis	4
Leap Frog	CDS	*
Light Cycle	PSS	*
Luna Crabs	Micromega	7
Magic Meanies	CDS	2
Maze Chase	Hewson	8
Meteor Storm	Quicksilva	7
Meteoroids	dk'tronics	7
Meteoroids	Softtek	6
Micro Mouse	Lothlorien	6
Millypede	Add-on	7
Mined Out	Quicksilva	7
Moon Buggy	Visions	6
Mr Wong's Loopy Laundry	Artic	6
Muncher	Silversoft	*
Muncher	Silversoft	6
Nanas	Mikro-Gen	*
Orbiter	Silversoft	7
Ostron	Softtek	*
Pengy	Micromania	4
Pitman Seven	Visions	*
Planetoids	Sinclair	8
Proteus	Abacus	5
Rapedes	Visions	*
Repulsar	Softtek	*
Rider	Virgin	6
Road Toad	dk'tronics	7
Robot Panic	Soft Mill	1
Sam Spade	Silversoft	5
Santa	Artic	*
Sentinel	Abacus	7
Shark Attack	Romik	5
Sheer Panic	Visions	7
Slippery Sid	Silversoft	8
Space Fighter	Winters	*
Space Intruders	Quicksilva	7
Space Lanes	Cathedral	*
Space Raiders	Sinclair	6
Space Zombies	Mikro-Gen	*
Spec. Frogs/ Showdown	Artic	*
Spec. Gobbleman	Artic	*
Spec. Invaders	Artic	*
Spec. Invasion Force	Artic	*
Spec. Scramble	Work Force	7
Spectipede	Mastertronic	5
Spectral Invaders	Bug-Byte	8
Spectral Panic	Hewson	5
Spectres	Bug-Byte	6
Strike Four	Spectresoft	4
Styx	Bug-Byte	7
Sub	Romik	*
Tank Battle	dk'tronics	8
3D Monster Chase	Romik	3

Train Game  
Trom  
Vortex  
Winged Warlord  
Wizard's Warriors  
Yomp

## Business

Finance Manager  
Home Computer Pack  
Masterfile 16  
Matcalc  
Micropen  
Vu-Calcul  
Vu-File

## Education

Alphabet  
Alphabet Games  
Apostrophe  
Ballooning  
Calpac 1-3  
Car Journey  
Cargo  
Chess Tutor  
Counting  
Counting  
Education One  
Educational  
Firework Music  
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40 Education Games  
Four Rules of Number  
French Voc Test  
Hidden Letters  
Hot Dot Spotter  
Integration  
Intermediate English 1-2  
Intermediate Maths 1-2  
Know Your Tables  
Language Devel. Series  
Language Devel. Series  
Learn Basic  
Learning Read 1  
Linear Programming  
Marks Book  
Maths Invaders  
Maths Tutor  
Matrix Operations  
Money  
Night Sky  
O Level Maths  
O Level Physics  
Paddington's Shopping Mix-up  
Pathfinder  
Polynomials  
Pre/early school cassettes  
Primary Arithmetic  
Punctuation Pete  
Regression  
Self-teach Program  
Shape Sorter  
Special Agent  
Spellbin  
Use and Learn

## Language

Beta Basic

## Practical

Biorythms  
Countries of the World  
Cycle Planner  
Map of the UK  
Shopping List  
Spectasort

## Puzzle

Flippit  
Hanoi King  
Lojix  
Nowotnik Puzzle  
Quazar

## Simulation

Air Traffic Controller  
Airliner  
Golf  
Golf

Microsphere  
dk'tronics  
JK Greye  
CDS  
Abersoft  
Virgin

OCP  
SD Micro  
Campbell  
Work Force  
Contrast  
Sinclair  
Sinclair

Widget  
Sinclair  
Sinclair  
Heinemann  
Calpac  
Heinemann  
Sinclair  
Artic  
Starter Soft  
Widget  
Lerm  
Startersoft  
Soft Cottage  
Collins  
Granada  
Micro Master

Tutorial  
Poppy  
Longman  
University  
Rose  
Rose  
Collins  
Glasson  
Micro Master  
Logic 3  
Poppy  
University  
Lerm  
Stell  
AD Software  
University  
Poppy  
Bridge  
Homestudy  
Homestudy

Collins  
Widget  
University  
Essex  
Rose  
Heinemann  
University  
Anvil  
Widget  
Heinemann  
Startersoft  
Microl

Betasoft

Spectrasoft  
Hewson  
Medidata  
Kuma  
SD  
Spectadraw

Sinclair  
Contrast  
Virgin  
Phipps  
Rose

Hewson  
Protek  
R & R  
Virgin

Golf  
NightFlite  
Print Shop  
Pro-Golf

## Strategy

Auto Chef  
Big Match Soccer  
Dallas  
Dictator  
Farmer  
Football  
Heathrow  
Las Vegas  
Quincy

## Traditional

Backgammon  
Bridge Tutor  
Bridgemaster  
Challenge  
Gambling Tape  
Las Vegas  
Odds-on  
Othello  
Pinball  
Pool  
Reversi  
Roulette  
Solo Whist  
Spec. Microchess  
Super Play I  
Tennis

## Utility

Aspect  
Audio Sonics  
Auto Sonics  
Basic Utilities  
Character Generator  
Dietron  
Disassembler  
Display  
Editor/Assembler  
Extended Basic  
FP Compiler  
Friendly Face  
Keysounder  
Letterfont  
Machine Code Test Tool  
Master Toolkit  
MCoder  
Micropen  
Print Utilities  
Programmer's Dream  
Renummer Delete  
Slow Loader  
Sound FX  
Spec. Bug  
Spec. Editor/ Assembler  
Spec. Monitor  
Spectrum Super Toolkit  
Spectsound  
Supercode  
Taswide-64  
Trace  
TT-S  
ZX Spectrum Assembler  
ZXED

Virgin  
Hewson  
CCS  
Hornby

CCS  
Winters  
CCS  
dk'tronics  
CCS  
Winters  
Hewson  
Temptation  
Severn

Hewson  
CP Software  
Bridgemaster  
Temptation  
Dymond  
Temptation  
RSD  
CP Software  
Winters  
Bug-Byte  
Sinclair  
Newsoft  
Video Soft.  
Artic  
Video  
Winters

Bug-Byte  
Work Force  
Buttercraft  
Jaysoft  
Spectrasoft  
Custom  
dk'tronics  
Work Force  
Picturesque  
CP Software  
Softtek  
Monitor  
S and G  
Allanson  
OCP  
OCP  
PSS  
Contrast  
Sinclair  
Work Force  
Work Force  
ELR  
dk'tronics  
Artic  
Picturesque  
Picturesque  
Nectarine  
PDQ  
CP  
Tasman  
Texgate  
Timedata  
McGraw Hill  
dk'tronics

## SPECTRUM 48K

## Adventure

Abyss  
Ace in the Hole  
Adventure 1  
Adventure Island  
Alchemist  
Arcane Quest  
Atlas Assignment  
Black Crystal  
Black Dwarf's Lair  
Black Planet  
Buffer Adventure  
Byte  
Castle  
Castle Blackstar  
Circus  
Classic Adventure

CCS  
Add-on  
Abersoft  
Contrast  
Beau Jolly  
Add-on  
Virgin  
Mastervision  
New Soft  
Phipps  
Buffer Micro  
CCS  
Bug-Byte  
SCR  
Channel 8  
Melbourne House

continued on page 194



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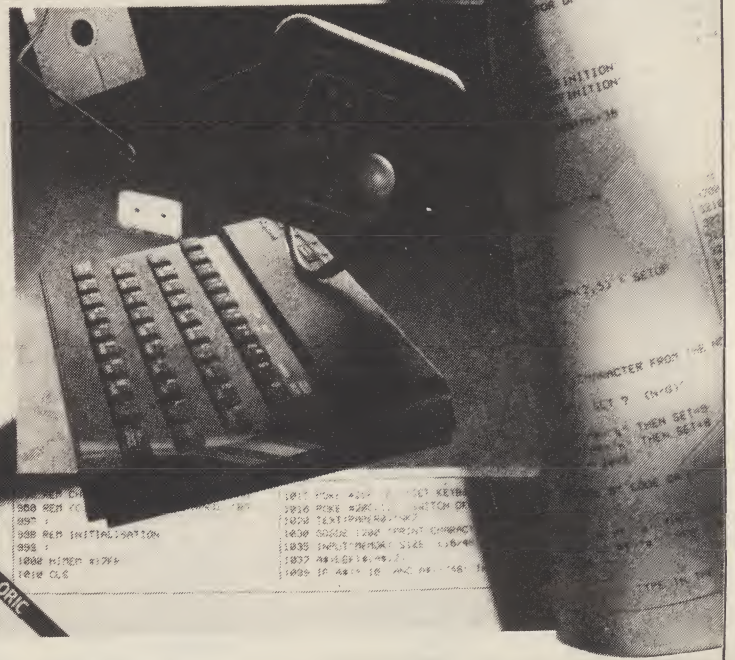
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## READERS PRO

In February's batch of readers' programs, we include programs for Spectra, Cric and Commodore 64 owners. Those of you with Spectra will be able to learn about the moon with Lunar Cycle or game your way on our trust machine. Cric owners can design their own shapes with our cards machine, better when Commodore 64 owners can get it done with Square. We do check the ratings but occasionally a little debugging may be required. But it's now time to send in your program PLEASE try to ensure it's bug free. We are looking for more good things and

unusually the same. All 1000 entries will be sent to the editor. Please do not send anything together with a copy. Please do not send anything together with a copy. Please do not send anything together with a copy.



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2	GALACTIC ATTACK	19	ORBITER	35	SUBMARINES
3	SPACE MISSION	20	MOTORWAY	36	ROCKET LAUNCH
4	LUNAR LANDING	21	FORCE FIELD	37	PLANETS
5	PLASMA BOLT	22	NIM	38	BLACK HOLE
6	STARTRK	23	TUNNEL ESCAPE	39	DYNAMITE
7	RADAR LANDING	24	BARREL JUMP	40	DO YOUR SUMS
8	ATTACKER	25	CANNONBALL	41	DERBY DASH
9	GALACTIC DOG	26	BATTLE	42	SPACE SEARCH
10	FIGHT	27	OVERTAKE	43	UNIVERSE
11	PSION ATTACK	28	SITTING TARGET	44	RATS
12	INVASIVE ACTION	29	SMASH THE WINDOWS	45	TANKER
13	CROSSSES	30	SPACE SHIP	46	PARACHUTE
14	BODGIES	31	JET FLIGHT	47	JET MOBILE
15	PONTON	32	PHASER	48	HIGH RISE
16	SKI JUMP	33	INTRUDER	49	THE FORCE
17	HANDMAN		INFERNO	50	EXCHANGE

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ATARI <input type="checkbox"/>	ATMOS <input type="checkbox"/>	DRAGON <input type="checkbox"/>	<input checked="" type="checkbox"/>

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SU/11/84



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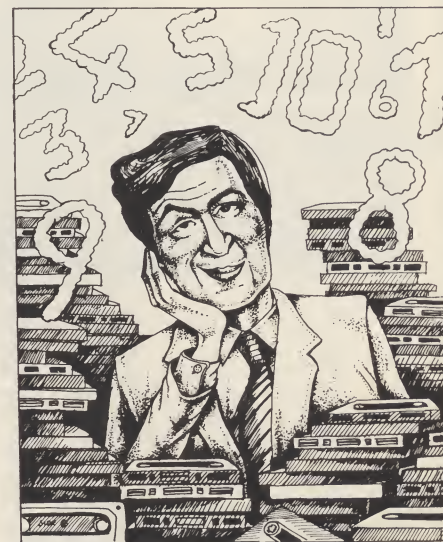
Colditz	Phipps	8	Carnival	Eclipse	5	Rider	Virgin	6
Colossal Caves	CP Software	8	Carpet Capers	Termial	7	River Rescue	Creative Sparks	3
Cry Wolf!	Add-on	*	Cavelon	Ocean	7	Robot Riot	Silversoft	6
Demon Lord	MCE	5	Centipoid Plus 3	Orwin	5	Rommels Revenge	Crystal	8
Detective	Arcade	7	Chequered Flag	Sinclair	8	Sabre Wolf	Ultimate	8
Devils of Deep	Shepherd	*	Chuckie Egg	A & F	8	Scuba Dive	Durrell	9
Diamond Quest	CCS	4	Chuckman	CCI/Add-on	8	Security Shelter	Add-on	*
Diamond Trail	Gilsoft	7	Close-In	Pulsonic	4	Skull	Games Machine	5
Dragonsbane	Quicksilva	6	Codename Mat	Micromega	9	Sorcery	Virgin	7
Dungeon Master	Crystal Comp.	8	Corridors of Genon	New Generation	9	Space Station Zebra	Beyond	6
Dungeons of Doom	Temptation	3	Cruise Attack	Mikro-Gen	*	Spectron	Virgin	6
Espionage Island	Artic	5	Cyber Zone	Crystal	*	Spellbound	Beyond	7
Everest Ascent	Sheperd	7	Death Chess 5000	Artic	7	Splat	Incentive	7
Fantasia Diamond	Hewson	6	Defenda	Interstella	2	Stop the Express	Sinclair	8
Golden Apple	Artic	7	Defendar	Mikro-Gen	*	Submarine Strike	Pulsonic	6
Gorgon	Phipps	*	Defusion	Incentive	6	Tank Trax	Mastertronic	3
Halls of Things	Crystal Comp.	9	Defusion/Worms	K-Tel	3	The Guardian	PSS	6
Here comes the sun	Alligata	7	Demon	Micocosm	*	The Pyramid	Fantasy	7
Hobbit	Melbourne House	9	Demon Chase	Mansfield	4	The Snowman	Quicksilva	8
Hole	Add-on	*	Devil Rides In	Mastertronic	7	3D Bat Attack	Cheetahsoft	6
Horror Atoll	Add-on	*	Dimension Destructors	Artic	8	3D Lunattack	Hewson	6
Inca Curse	Artic	6	Dinky Digger	Postern	4	3D Seiddab Attack	Hewson	5
Inferno	Shepherd	7	Dodge City	Phoenix	7	3D Star Wars	Add-on	1
Invincible Island	Shepherd	8	Dr Franky and the Monster	Virgin	6	3D Tunnel	New Generation	9
Island	Crystal	4	Driller Tanks	Sinclair	3	Time Gate	Quicksilva	8
Island	Virgin	7	Elektro Storm	PSS	*	Timebomb	CDS	7
Jericho Road	Shards	7	Energy 30,000	Elm	3	Tobor	Add-on	7
Jungle Adventure	CCS	4	Eric and the Floaters	Sinclair	6	Tornado Low Level	Vortex	8
Knight's Quest	Phipps	6	Eskimo Eddie	Ocean	4	Tranz Am	Ultimate	*
Leopard Lord	Add-on	7	Frank N Stein	PSS	7	Trashman	New Generation	8
Lords of Midnight	Beyond	9	Freez Beez	Quicksilva	6	Traxx	Quicksilva	7
Lords of Time	Level Nine	8	Froot Loop	Silversoft	*	Tribble Trouble	Software Projects	8
Lost Over Bermuda	Add-on	*	Galaxy Attack	NTD Software	5	Trom	dk'tronics	4
Mad Martha	Mikro-Gen	7	Glug Glug	Sunshine	4	Tutankhamun	Micromania	8
Mad Martha II	Mikro-Gen	*	Harry Goes Home	CRL	6	Two-Gun Turtle	Lothlorien	7
Mountains of Ket	Incentive	8	Hickstead	Pulsonic	6	Warlock of Firetop		
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Mysterious Fairground	Buffer Micro	6	House of Living Dead	Work Force	9	Wheelie	Microsphere	7
Odyssey of Hope	Martech	6	Hunchback	Phipps	*	Worm Attack	Pulsonic	2
Oracle's Cave	Doric	8	Invasion Body Snatch.	Ocean	7	Worse Things Happen at Sea	Silversoft	7
Orb	Comp. Rentals	*	Jack and the Beanstalk	Crystal	9	Xadom	Quicksilva	4
Paradox	Runesoft	2	Jackpot	Thor	5	Zig-Zag	dk'tronics	7
Perseus and Andromeda	Channel 8	7	Jet Set Willy	Comp. Rentals	*	Zipper Flipper	Sinclair	4
Pimania	Automata	7	Killer Knight	Software Projects	9			
Quest	Hewson	7	Knight Rider	Phipps	5	<b>Business</b>		
Quetzalcoatl	Virgin	8	Kosmic Kanga	Hewson	*	Account Management		
Roundsby Incident	Add-on	*	Krakatoa	Micromania	5	System	Fulwood	*
Satan's Pendulum	Minatron	7	Krazy Kong	AbbeX	8	Accounts (Limited		
Sherlock	Melbourne House	9	Laser Zone	PSS	*	Company)	Hestacrest	*
Ship of Doom	Artic	7	Laserwarp	Quicksilva	8	Accounts (Sole Trader)	Hestacrest	*
Solaris	Softel	*	Last Sunset Lattica	Mikro-Gen	6	Address File	SD Micro	*
Spoof	Runesoft	7	Lazatron	Arcade	*	Address Manager	OCP	7
Snowball	Level 9	9	Les Flics	Contrast	*	Bank Account System	K Gouldstone	8
Superspy	Shepherd	5	Loony Zoo	PSS	6	Bank Verifier	SD Micro	*
Temple of Vran	Incentive	8	Lunar Jetman	Phipps	6	Business Bank Account	Transform	*
Terror from The Deep	Add-on	*	Manic Miner	Ultimate	8	Cash Controller	Shepherd	7
Time Quest	Mikro-Gen	5	Matrix	Bug-Byte	9	Collector's Pack	Sinclair	7
Titanic	R&R	7	Maze Death Race	Salamander	7	Critical Path Analysis	Hilderbay	*
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Vampire Village	Terminal	4	Mission Omega	Silversoft	6	Investment, Insurance,		
Velnor's Lair	Quicksilva	8	Monkey Biznes	Pulsonic	4	Information	Inform	5
Volcanic Dungeon	Mastervision	6	Moon Alert	Artic	7	Masterfile	Campbell	8
Width of the World	Mosaic	4	Moons of Tantalus	Ocean	*			
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Ziggurat of Dread	Add-on	*	Mummy Mummy	Ocean	7			
			Munnery's Mergatroids	Lothlorien	6			
			1994	Abacus	6			
			Olympimania	Visions	4			
			Orion	Automata	6			
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			Pedro	Mikro-Gen	*			
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			Raider Cursed Mine	Beyond	9			
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			Rescue	Gemini	7			
			Revenge of the Killer	Comp. Rentals	*			
			Tomatoes	Ocean	*			
				Visions	6			

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Adven. of a St Bernard  
Alcatraz Harry  
Android Two  
Ant Attack  
Antics  
Arena 3000  
Armageddon  
Atic Atac  
Automania  
Base Invaders  
Bear Bovver  
Birds and Bees  
Blade Alley  
Blue Thunder  
Brain Damage  
Bubble Buster  
Bubble Trouble  
Bugaboo  
Butterfly  
Caesar the Cat

Gargoyle Games  
Mastertronic  
Mastertronic  
Vortex  
Quicksilva  
Bug-Byte  
Microdeal  
Silversoft  
Ultimate  
Mikro-Gen  
Work Force  
Artic  
Bug-Byte  
PSS  
Foundry Systems  
Silversoft  
Sinclair  
Arcade  
Quicksilva  
Pulsonic  
Mirrorsoft

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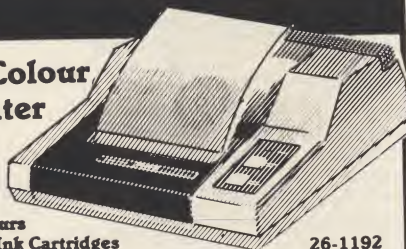


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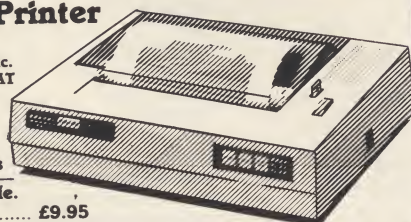


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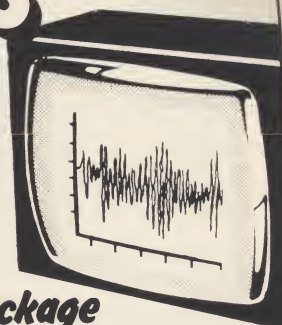
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Small Business Accounts  
Spectext  
Spreadsheet  
Stock Control  
Stock Control  
Stock Control  
Tasword  
Tasword II  
Utility File  
Word Processor  
Word Processor

## Education

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Angle  
Angle Turner  
Astro Maths  
Blockbuster  
Castle  
Castle of Dreams  
Castle Spellerous  
Chess Tutor 1  
Cortez  
Countabout  
Dyslexia Beater  
Eiffel Tower  
Electronic Learner's Guide  
No. 1  
French is Fun  
French Mistress  
French Voc Test  
German is Fun  
German Master  
Guitar Tutor 1  
Guitar Tutor 2  
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Hotline  
Humpty Dumpty  
Inkosi  
Jungle Jumble  
Jungle Maths  
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Letters and Numbers  
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Look Sharp  
Magnets  
Make-a-Chip  
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Mathskills II  
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Model Maths  
Mr T's Measuring Games  
Mr. Men  
Musicmaster  
Nineteenth C. England  
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O Level Physics  
Party Time  
Pathfinder  
Pirate  
Quick Thinking  
Sequences  
Spanish Gold  
Speak and Spell  
Speech Marks  
Spelling Bee  
Star Reader  
Startrucker  
Teacher Data  
Tense French  
Time Traveller  
Tuner  
Whizz Kid  
Wizard Box  
Zoo

## Language

Forth  
Forth  
48/80 Forth

Contrast  
ISP  
Microsphere  
Hilderbay  
Transform  
V&H Computing  
Hilton

Fulwood  
Transform  
Sinclair  
McGraw Hill  
Microl  
Hilderbay  
Kemp  
Transform  
Tasman  
Tasman  
SD Micro  
Microl  
Quicksilva

Longman  
Chalksoft  
Arnold Wheaton  
Scisoft  
Compusound  
L'Ensoulaiado  
Widgit  
Sinclair  
Sinclair  
L'Ensoulaiado  
Longman  
Dunitz  
Chalksoft

ETST  
CDS  
Kosmos  
Tutorial  
CDS  
Kosmos  
Harlequin  
Harlequin  
Chalksoft  
Chalksoft  
Widget  
Chalksoft  
Chalksoft  
Clever Cloggs  
Scisoft  
Sinclair  
Jimjams  
Silversoft  
Mirrorsoft  
Sinclair  
Sinclair  
Sussex  
Griffin  
MDA Assoc.  
Jive

Ebury  
Mirror  
Sinclair  
Sussex  
Calpac  
Think Tank  
C. Tutor  
Widget  
Chalksoft  
Mirrorsoft  
Chalksoft  
Chalksoft  
S and G  
Sinclair  
Image Systems  
Scisoft  
Widget  
B Farris  
Sulis  
Willey  
Soft Cottage  
Comp. Tutor  
Scisoft  
L'Ensoulaiado

Melbourne House  
Sinclair  
E. London

5 Logo  
6 Micro Prolog  
9 Pascal Compiler  
9 Snail Logo  
\* Spec. Forth  
\* Spec. Forth  
\* ZX Forth  
  
**Practical**  
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7 Cricket Averages  
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8 First Aid  
9 Football Pools  
\* How Long have you got?  
\* I Ching  
2 I Ching  
Personal Reminder  
Spectadraw 2  
Star Gazer  
The Complete Guide to  
Medicine  
Vega-Table  
World Info

**Puzzle**  
Arcturus  
Computaword  
Flix  
Hanoi King  
Jumbly  
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3D Strategy  
  
**Simulation**  
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Cricket Captain%Allanson  
Fighter Pilot  
Flight Simulation  
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Inkos  
Match Point  
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The Forest  
The Forest  
Troon  
United  
World Cup Football

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Battle of Britain  
Brewery  
British Lowland  
Caribbean Trader  
Conflict  
Conquest  
Dix Mille  
Fall of Rome  
Football Manager  
Galaxy Conflict  
Galaxy Conflict  
Gangsters  
Gatecrasher  
General Election  
Golf  
Great Britain Ltd  
Hunter Killer  
It's Only Rock 'n' Roll  
Johnny Reb  
King Arthur  
Millionaire  
Mugsy  
New Venture

Sinclair  
Sinclair  
Hi-Soft  
CP  
Abersoft  
CP  
Artic

Beamsan  
Bug Byte  
Spartan CC  
dk'tronics  
Diet Master  
Keysoft  
Spectrasoft  
Eastmead  
Hartland  
Eastmead  
Salamander  
Sirius  
SD Micro  
McAlley  
CRL  
  
Eastmead  
Vega  
Wimsoft

Visions  
Work Force  
Softtricks  
Contrast  
dk'tronics  
PAL  
Bellflower  
Quicksilva

Pulsonic  
Digital Integration  
Sinclair  
Micromega  
dk'tronics  
Wyvern  
Chalksoft  
Sinclair  
Hornby  
CRL  
Ocean  
Micromart  
Winters  
Comp. Rentals  
Phipps  
Phipps  
Hornby  
CCS  
Artic

CCS  
Virgin  
Red Shift  
CCS  
Microgame  
CCS  
CCS  
E. Midland  
Martech  
Cheetahsoft  
CCS  
ASP  
Addictive Games  
Martech  
Martech  
CCS  
Quicksilva  
Bug-Byte  
Virgin  
Hessel  
Protek  
K-Tel  
Lothlorien  
E. Midland  
Incentive  
Melbourne House  
Falcon

9 1984  
8 Oligopoly  
\* Plunder  
8 Red Weed  
9 Reichswald  
8 Scatterbrain  
8 Sheepwalk  
8 Special Operations  
Spectrealm  
9 Star Trader  
5 Stonkers  
7 Super-League  
\* Tradewind  
6 War 70  
4 Warlord  
\* Whodunnit  
4 Wilfred the Hairy

## Traditional

7 Arcturus  
\* Backgammon  
\* Brag  
\* Bridge Master  
8 Bridge Player  
Bullseye  
4 Derby Day  
7 Do Not Pass Go  
\* Double Dealer  
Draughts  
Evolution  
Go To Jail  
Grid run/Pontoon  
Mind Games  
Original Superchess  
Pontoon  
\* Ramopoly  
6 Roulette  
7 Scrabble  
8 Snooker  
Super Bridge  
Superchess II  
Superchess III  
The Turk  
Voice Chess  
Yahtzi  
8 Yatzee  
\* ZX Draughts  
8 ZX Reversi  
\* ZX-Chess II

## Utility

Allsort S-1  
Assembler  
Beyond Basic  
Building Price  
Cartoon Animation  
Character Generator  
Compiler  
Composer  
DLAN  
FP Compiler  
Games Designer  
HURG  
Keyword Extension  
Linked Software:  
\* Information Handling  
\* List File  
\* Make Music  
8 Melbourne Draw  
\* Monitor/Diss.  
7 Music Maker  
\* Paintbox  
6 Print Utilities  
5 Quill  
6 Screen Machine  
7 Softalk 1-2  
\* Spec. Assembler  
8 Spec. Compiler  
8 Spectre Mac/Mon  
7 Spectrosim  
1 Spectrum Extended Basic  
7 Spectrum Monitor  
7 Spectrum Sprites  
9 Spectrum Super Toolkit  
5 Supercode II  
\* The Complete Machine Code  
\* Tutor  
7 Trans Express  
8 Vu3D  
4 Zeus Assembler

Incentive  
CCS  
CCS  
Lothlorien  
MW Gamesworld  
Manor  
Virgin  
Lothlorien  
Runesoft  
Bug-Byte  
Beau Jolly  
Cross  
WDS  
CCS  
Lothlorien  
CCS  
Microbyte

Visions  
CP Software  
T Lebon  
Serim  
CP Software  
Mastertronic  
CRL  
Work Force  
MFM Software  
CP Software  
Microsphere  
Automata  
Arcade  
Oasis  
CP Software  
Contrast  
J Fletcher  
Dymond  
Sinclair  
Visions  
Buffer Micro  
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CP Software  
OCP  
Artic  
Work Force  
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CP Software  
CP Software  
Artic

A Firminger  
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Sinclair  
J Redman  
Fowler  
ISP  
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Campbell  
Softtek  
Quicksilva  
Melbourne House  
Timedata

McGraw Hill  
SD Micro  
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Artic  
Softtek  
Oasis  
Shiva  
CP Software  
Picturesque  
ISP  
Nectarine  
CP Software  
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Romantic Robot  
Sinclair  
Sinclair



# Software Publishers

**A & F Software**, Unit 8, Canalside Industrial Estate, Woodbine Street East, Rochdale, Lancashire OL16 5LB  
**Abacus Software**, 21 Union Street, Ramsbottom, Nr Bury, Lancashire  
**Abbex**, 20 Ashley Close, Manor Hall Drive, London NW4  
**Abersoft**, 7 Maesfallen, Bow Street, Aberystwyth, Wales  
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**Artic Computing**, Main Street, Brandesburton, Driffield YO25 8RG  
**Automata UK**, 27 Highland Road, Portsmouth, Hampshire PO4 9DA  
**Axis**, 71 Brookfield Avenue, Loughborough, Leicestershire LE11 3LN  
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**Bellflower Software**, 6 Rosewood Avenue, Greenford, Middlesex UB6 7QP  
**Betasoft**, 92 Oxford Road, Moseley, Birmingham B13 9SQ  
**Beyond Software**, 8 Herbal Hill, London EC1  
**Bridge Software**, 36 Fernwood, Marple Bridge, Stockport, Cheshire SK6 5BE  
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**CCS**, 14 Langton Way, Blackheath, London SE3 7TL  
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**Griffin & George**, Frederick Street, Birmingham B1 3HT  
**Harlequin Software**, 43 Osprey Park, Thornbury, Bristol BS12 1LY  
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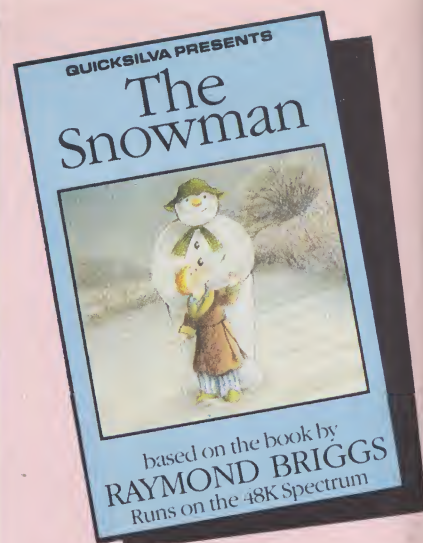
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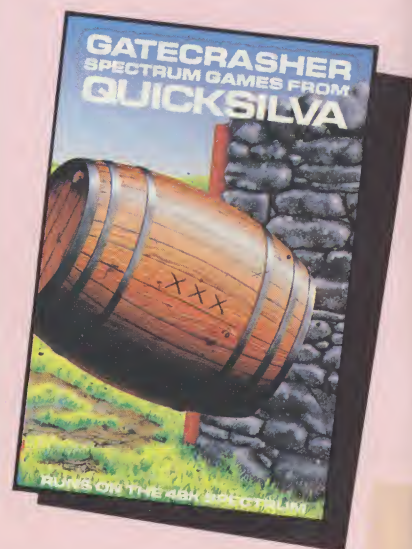
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